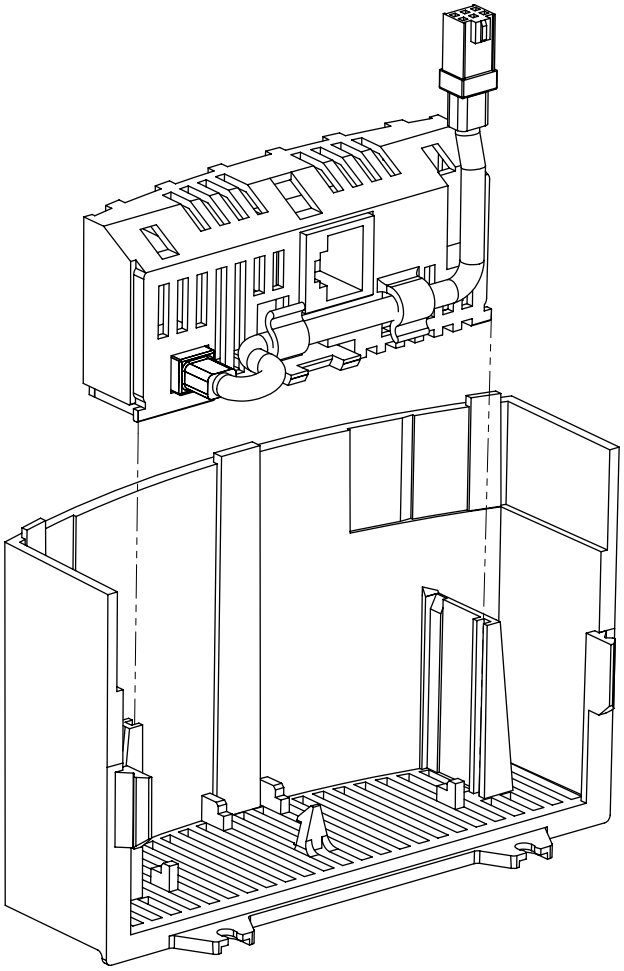
Lenze
AC Tech



SMVector EtherNet/IP Communication Module

Communications Interface Reference Guide

About These Instructions

This documentation applies to the optional EtherNet/IP communications module for the SMVector inverter and should be used in conjunction with the SMVector Operating Instructions (Document SV01) that shipped with the drive. These documents should be read in their entirety as they contain important technical data and describe the installation and operation of the drive.

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1 Safety Information

1.1 Warnings, Cautions and Notes

1.1.1 General

Some parts of Lenze controllers (frequency inverters, servo inverters, DC controllers) can be live, moving and rotating. Some surfaces can be hot.

Non-authorized removal of the required cover, inappropriate use, and incorrect installation or operation creates the risk of severe injury to personnel or damage to equipment.

All operations concerning transport, installation, and commissioning as well as maintenance must be carried out by qualified, skilled personnel (IEC 364 and CENELEC HD 384 or DIN VDE 0100 and IEC report 664 or DIN VDE0110 and national regulations for the prevention of accidents must be observed).

According to this basic safety information, qualified skilled personnel are persons who are familiar with the installation, assembly, commissioning, and operation of the product and who have the qualifications necessary for their occupation.

1.1.2 Application

Drive controllers are components designed for installation in electrical systems or machinery. They are not to be used as appliances. They are intended exclusively for professional and commercial purposes according to EN 61000-3-2. The documentation includes information on compliance with EN 61000-3-2.

When installing the drive controllers in machines, commissioning (i.e. the starting of operation as directed) is prohibited until it is proven that the machine complies with the regulations of the EC Directive 98/37/EC (Machinery Directive); EN 60204 must be observed.

Commissioning (i.e. starting drive as directed) is only allowed when there is compliance to the EMC Directive (89/336/EEC).

The drive controllers meet the requirements of the Low Voltage Directive 73/23/EEC. The harmonised standards of the series EN 50178/DIN VDE 0160 apply to the controllers.

The availability of controllers is restricted according to EN 61800-3. These products can cause radio interference in residential areas. In the case of radio interference, special measures may be necessary for drive controllers.

1.1.3 Installation

Ensure proper handling and avoid excessive mechanical stress. Do not bend any components and do not change any insulation distances during transport or handling. Do not touch any electronic components and contacts. Controllers contain electrostatically sensitive components, which can easily be damaged by inappropriate handling. Do not damage or destroy any electrical components since this might endanger your health! When installing the drive ensure optimal airflow by observing all clearance distances in the drive's user manual. Do not expose the drive to excessive: vibration, temperature, humidity, sunlight, dust, pollutants, corrosive chemicals or other hazardous environments.

1.1.4 Electrical Connection

When working on live drive controllers, applicable national regulations for the prevention of accidents (e.g. VBG 4) must be observed.

The electrical installation must be carried out in accordance with the appropriate regulations (e.g. cable cross-sections, fuses, PE connection). Additional information can be obtained from the regulatory documentation.

The regulatory documentation contains information about installation in compliance with EMC (shielding, grounding, filters and cables). These notes must also be observed for CE-marked controllers.

The manufacturer of the system or machine is responsible for compliance with the required limit values demanded by EMC legislation.

1.1.5 Operation

Systems including controllers must be equipped with additional monitoring and protection devices according to the corresponding standards (e.g. technical equipment, regulations for prevention of accidents, etc.). You are allowed to adapt the controller to your application as described in the documentation.

DANGER!
- After the controller has been disconnected from the supply voltage, do not touch the live components and power connection until the capacitors have discharged. Please observe the corresponding notes on the controller.
- Do not continuously cycle input power to the controller more than once every three minutes.
- Close all protective covers and doors during operation.

WARNING!
Network control permits automatic starting and stopping of the inverter drive. The system design must incorporate adequate protection to prevent personnel from accessing moving equipment while power is applied to the drive system.

Table 1: Pictographs used in these instructions

Pictograph	Signal word	Meaning	Consequences if ignored
	DANGER!	Warning of Hazardous Electrical Voltage.	Reference to an imminent danger that may result in death or serious personal injury if the corresponding measures are not taken.
	WARNING!	Impending or possible danger for persons	Death or injury
	STOP!	Possible damage to equipment	Damage to drive system or its surroundings
	NOTE	Useful tip: If observed, it will make using the drive easier	

2 Introduction

EtherNet/IP just like its close siblings DeviceNet and ControlNet, uses CIP (Common Industrial Protocol a.k.a. Control and Information Protocol) to exchange data between devices on an Ethernet network. AC Tech implementation of CIP follows the standard supported by the ODVA (governing organization) and supports the two main types of EtherNet/IP communication: Explicit Messaging and I/O Messaging.

The purpose of this document is to describe the EtherNet/IP implementation specifics for the SMV drive as well as provide the necessary information and examples for users and network programmers. This document assumes the reader is familiar with the general concept of CIP and has a basic knowledge of Ethernet TCP/IP communication principles.

2.1 EtherNet/IP Overview

EtherNet/IP implements network protocol using the seven layer Open Systems Interconnection (OSI) model as illustrated in Figure 1. Ethernet has an active infrastructure and as such EtherNet/IP can support an almost unlimited number of point-to-point nodes. The EtherNet/IP system requires just one connection for configuration and control. An EtherNet/IP system uses peer-to-peer communication and can be setup to operate in a master/slave or distributed control configuration.

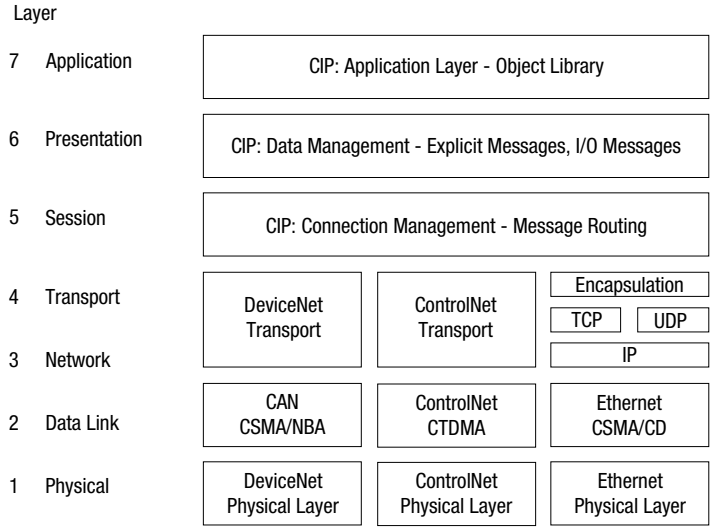


Figure 1: OSI Model

2.2 Ethernet TCP/IP Configuration

Typically, an EtherNet/IP network is made up of segments containing point-to-point connections in a star configuration as illustrated in Figure 2. At the center of this star topology is a bank of Ethernet 2 & 3 switches that can support a great number of point-to-point nodes.

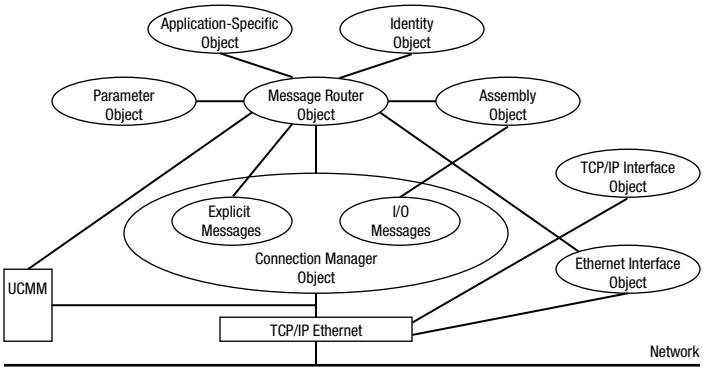


Figure 2: EtherNet/IP Star Configuration

2.2.1 MultiCast Configuration

By default the SMVector drive automatically generates the multicast address used for I/O messaging. The default multicast TTL (time to leave) value is 1 which means that the multicast I/O packets will be propagated over the local subnet only.

The user is allowed to explicitly set the drive's multicast address and TTL values but this feature should be used carefully. The TTL and Mcast Config attributes in the TCP/IP object are also implemented. Note that the Num Mcast value in the Mcast Config attribute must always be 1. The user configurable SMVector system variables for multicast are:

Variable ID	Meaning
426	TTL
422-425	Multicast address (default 239.64.2.224)

2.2.2 IGMP Implementation

The IGMP v2 version of the IGMP (Internet Group Management Protocol) is used.

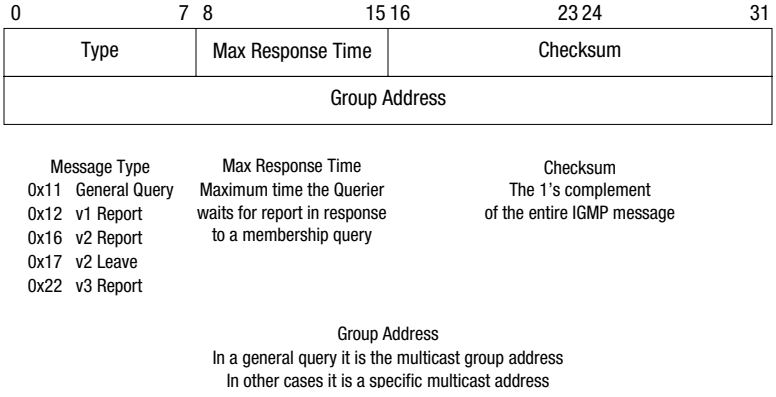


Figure 3: IGMP v2 Message Format

2.2.3 TCP/IP Sockets

The SMVector drive supports up to 2 TCP/IP socket connections.

2.2.4 CIP Connections

The SMVector drive supports up to 6 CIP connections.

2.3 Module Specification

- Auto detection of data rates
- Supported baudrates: 10 BaseT, 100 BaseT
- Scalable amount of input and output process data words (4 output, 4 input).
- Parameter access data channel
- To simplify setup and operation, implemented classes and behavior conform to the AC DRIVE profile as specified in the ODVA Common Industrial Protocol (CIP) Specification.

2.4 Module Identification Label

Figure 4 illustrates the labels on the SMV EtherNet/IP communications module. The SMVector EtherNet/IP module is identifiable by:

- Two labels affixed to either side of the module.
- The color coded identifier label in the center of the module.

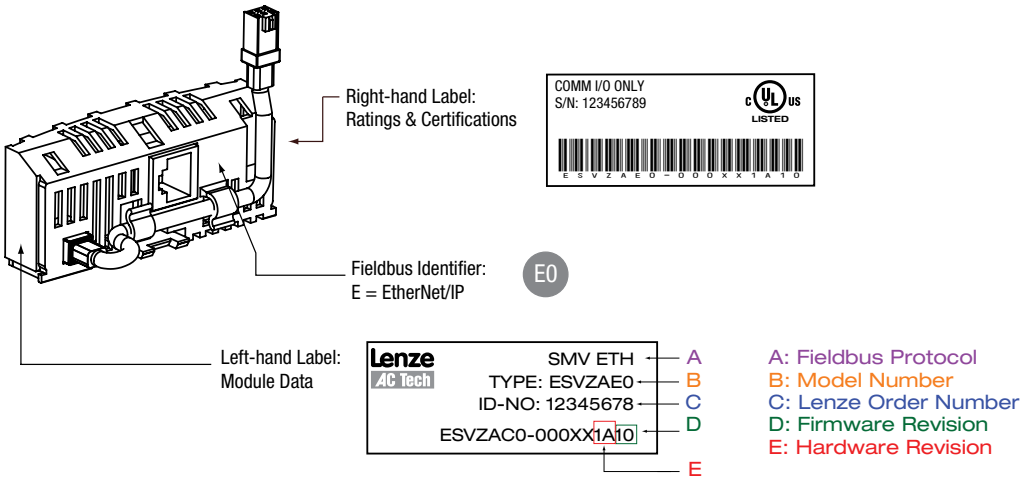
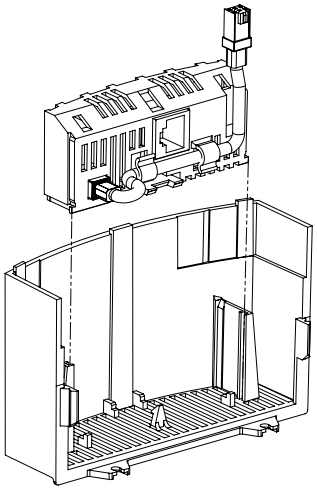


Figure 4: EtherNet/IP Module Labels

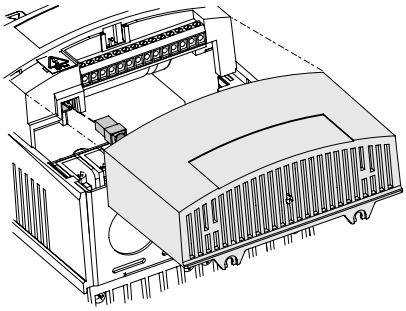
3 Installation

3.1 Mechanical Installation

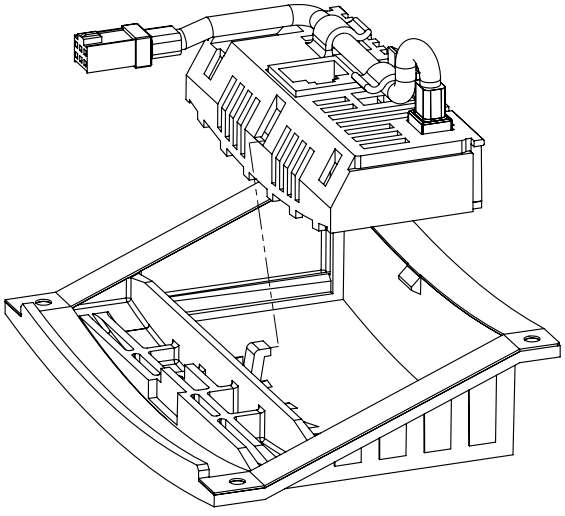
1. Ensure that the AC supply has been disconnected before opening the terminal cover.
2. Insert the EtherNet/IP option module in the terminal cover and securely “click” into position as illustrated in Figure 5.
3. Wire the network cables as detailed in paragraph 3.2, *Electrical Installation* to the connector provided and plug the connector into the option module.
4. Align terminal cover for re-fitting, connect the module umbilical cord to the drive then close the cover and secure, as shown in Figure 6.



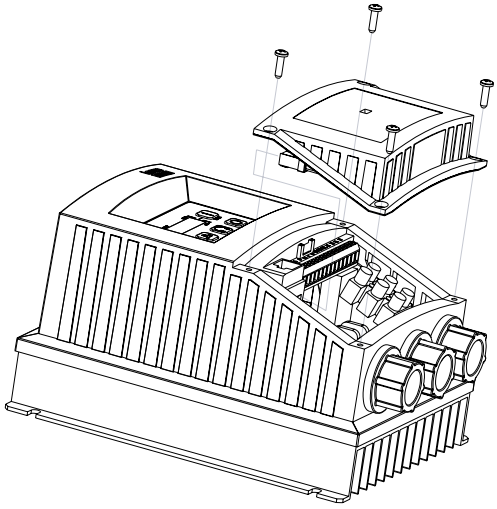
NEMA 1



NEMA 1



NEMA 4



NEMA 4

Figure 5: Installing the EtherNet/IP Communications Module

Figure 6: Re-Installing the Terminal Cover

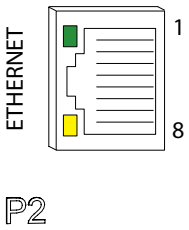
3.2 Electrical Installation

3.2.1 Ethernet RJ-45 Socket

The ethernet interface on the SMV is an RJ-45 Ethernet socket used to communicate with a host via Ethernet TCP/IP. Table 2 identifies the terminals and describes the function of each.

Table 2: P2 Pin Assignments (Communications)

Pin	Name	Function	RJ45 Connector
1	+ TX	Transmit Port (+) Data Terminal	P2
2	- TX	Transmit Port (-) Data Terminal	
3	+ RX	Receive Port (+) Data Terminal	
4	N.C.		
5	N.C.		
6	- RX	Receive Port (-) Data Terminal	
7	N.C.		
8	N.C.		



The status LEDs integrated in the RJ-45 socket indicate link and activity. The green LED indicates whether a link is established with another network device. The yellow LED indicates link activity and flashes when data is received by the EtherNet/IP module.

3.2.2 Grounding

The SMV EtherNet/IP module must be gounded. Attach the ground wire/lug from the module to one of the the chassis ground screws on the drive as illustrated in Figure 7.

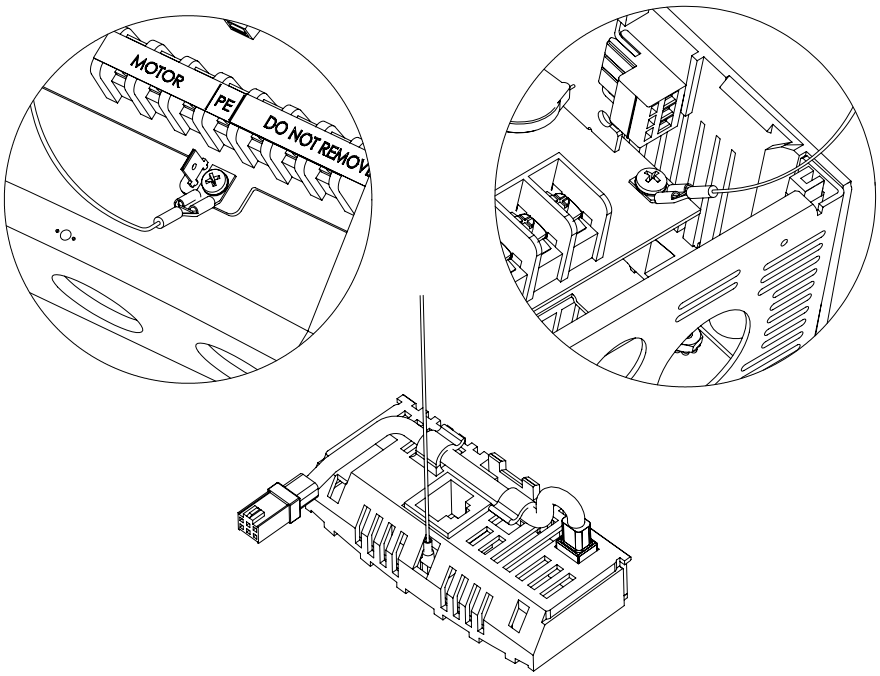


Figure 7: Wiring the EtherNet/IP Module Ground Harness

3.2.3 Cabling

To ensure long-term reliability it is recommended that any cables used to connect a system together are tested using a suitable Ethernet cable tester, this is of particular importance when cables are made up on site. It is recommended that a minimum specification of CAT5e is installed on new installations, as this gives a good cost performance ratio. If you are using existing cabling this may limit the maximum data rate depending on the cable ratings. In noisy environments the use of STP or fiber optic cable will offer additional noise immunity.

3.2.4 Maximum Network Length

The main restriction imposed on Ethernet cabling is the length of a single section of cable as detailed in Table 3. If distances greater than this are required it may be possible to extend the network with additional switches or by using a fiber optic converter. Cabling issues are the single biggest cause of network downtime. Ensure cabling is correctly routed, wiring is correct, connectors are properly fitted and any switches or routers used are rated for industrial use. Office grade Ethernet equipment does not offer the same degree of noise immunity as equipment intended for industrial use.

Table 3: Maximum Network Length

Type of Cable	Data Rate (bits/sec)	Maximum Trunk Length (m)
Copper - UTP/STP CAT 5	10M	100
Copper - UTP/STP CAT 5	100M	100
Fiber Optic - Multi-mode	10M	2000
Fiber Optic - Multi-mode	100M	3000
Fiber Optic - Single-mode	10M	no standard
Fiber Optic - Single-mode	100M	up to 100000

NOTE
The distances specified are absolute recommended maximums for reliable transmission of data. The distances for the fiber optic sections will be dependent on the equipment used on the network. The use of wireless networking products is not recommended for control systems, as performance may be affected by many external influences.

3.2.5 Minimum Node to Node Cable Length

There is no minimum length of cable recommended in the Ethernet standards for UTP or STP. For consistency across fieldbus modules, a minimum network device-to-device distance equal to 1 meter of cable is recommended. This minimum length helps to ensure a good bend radius on cables and avoids unnecessary strain on connectors.

3.2.6 Network Topology

Given its universal connectivity, an ethernet network may contain varied connection devices including hubs, switches and routers. Mixing commercial and industrial ethernet networks is possible but care should be taken to ensure clean data transmission. A large, high performance industrial Ethernet network is best served by managed switches that permit data control and monitoring capability.

3.2.6.1 Hubs

A hub provides a basic connection between network devices. Each device is connected to one port on the hub. Any data sent by a device is then sent to all ports (floods) on the hub. The use of hubs is not recommended for use within control systems due to the increased possibility of collisions. Collisions can cause delays in data transmission and are best avoided, in severe cases a single node can prevent other nodes on the same hub (or collision domain) from accessing the network. If using hubs or repeaters you must ensure that the path variability value and propagation equivalent values are checked. This is beyond the scope of this manual.

3.2.6.2 Switches

Switches offer a better solution to hubs because after initially learning the addresses of connected devices the switch will only send data to the port that has the addressed device connected to it. This prevents excessive traffic. Some managed switches allow the switching of data to be controlled and monitored which may be of particular importance on large or high performance systems. The word “switch” is sometimes used interchangeably with the terms scanner, matrix and bridge.

3.2.6.3 Routers

A router is used to communicate between two physical networks (or subnets) and provides some degree of security by allowing only defined connections between the two networks. A typical use would be connecting the office and manufacturing networks or connecting a network to an I.S.P (Internet Service Provider). A router is sometimes known as a gateway as it provides a “gateway” between two networks.

3.2.6.4 Firewalls

A firewall allows separate networks to be connected together similar to a router, however the firewall offers more security features and control. Typical features include address translation, port filtering, protocol filtering, URL filtering, port mapping, service attack prevention, monitoring and virus scanning. A firewall is the preferred method of allowing traffic from a manufacturing network to the business network.

3.2.6.5 VPN (Virtual Private Network)

A VPN is a method of using a non-secure or public network that allows devices to be connected together as if they were connected on a private network. A typical example would be the connection of two remote offices such as London and New York. Each office would require a high speed Internet connection and a Firewall (or VPN device). In order to configure the VPN, encryption keys are exchanged so that both offices can communicate. The data is then sent across the Internet (or shared network) in an encrypted form, giving the illusion of a single connected network (speed limitations may apply).

3.2.7 Example Networks

3.2.7.1 Single PC to Single SMVector Drive

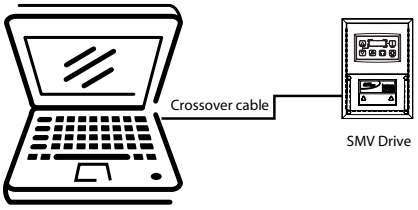


Figure 8: PC to SMV Drive

3.2.7.2 Single PC to Multiple SMVector Drives and Single Switch

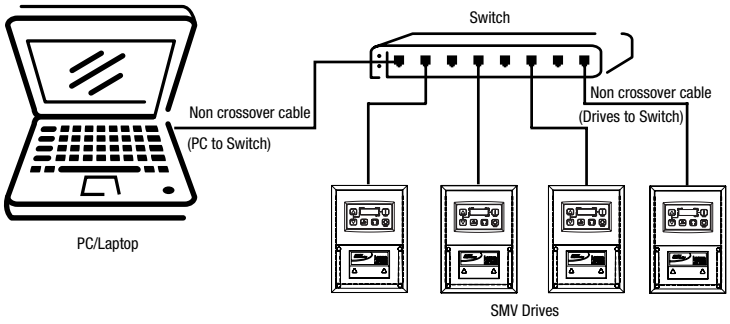


Figure 9: PC to Multiple SMV Drives

3.2.7.3 Single PC to Multiple SMVector Drives and Multiple Switches

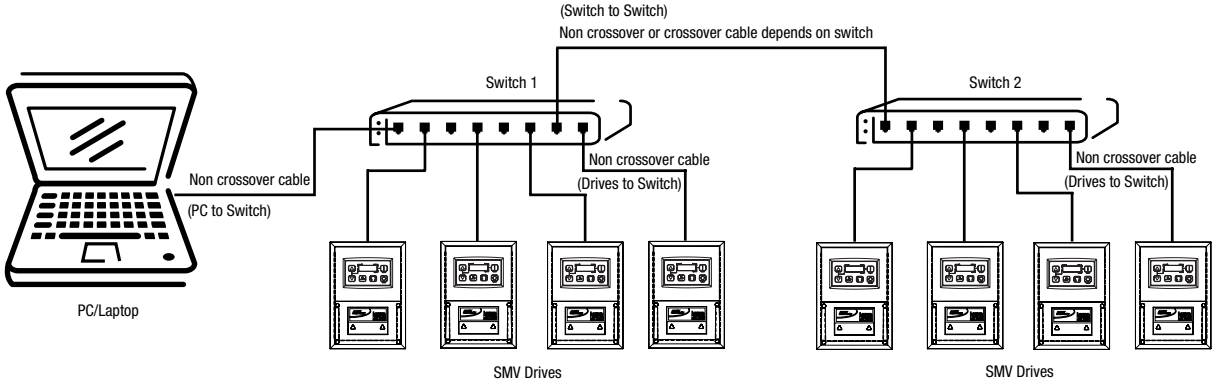


Figure 10: PC to Multiple SMV Drives and Multiple Switches

4 Commissioning

To setup an Ethernet/IP network, the ethernet port on each device that will be part of the network must be configured. For the example illustrated in section 4.3 of this manual, the devices on the network include an Allen-Bradley 1769-L32E CompactLogix controller, a PC and an SMVector drive with the EtherNet/IP option module.

4.1 Connect to the Drive

The SMVector has an OnBoard web server which can be used to setup the module and for troubleshooting purposes. It can be accessed from a standard web browser. The built-in webserver allows any parameter to be read or written to the drive and provides access to the drive's diagnostic parameters.

STOP
In order for the drive to accept any writes from the webserver or the network in general, one of the programmable inputs (TB-13A, TB-13B or TB-13C must be (manually) configured as Network Enable (i.e., P121, P122 or P123 = 9). Also, the configured input must be asserted via wiring such as a jumper between the input (TB-13A, TB-13B or TB-13C) and pin 4 on the SMV control terminal strip.

To access the drive's webserver first set your PC's IP address to be on the same subnet as the drive (the first three octets of the IP matching, with the final octet being unique). Refer to section 4.1.1.

4.1.1 Configuring the PC IP Address (Windows XP)

NOTE
This section of the manual gives some guidance on how to configure the Ethernet communications setting on a PC to communicate with an SMV drive. Additional material for other operating systems/platforms may be available from the website or as an appendix to existing drive documentation.

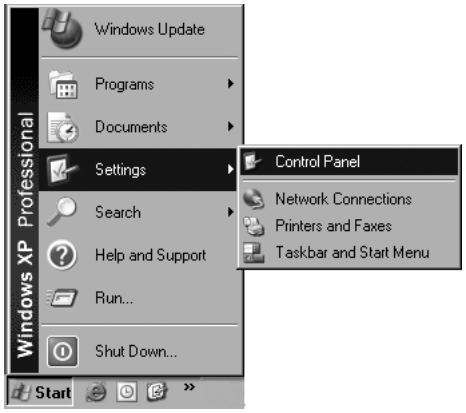
If the drive and PC are both assigned automatic IP addresses from a DHCP enabled server then configuration of the PC port should not be necessary.

However, in an industrial automation network it is recommended to use fixed IP addresses to ensure the reliability and control of the network.

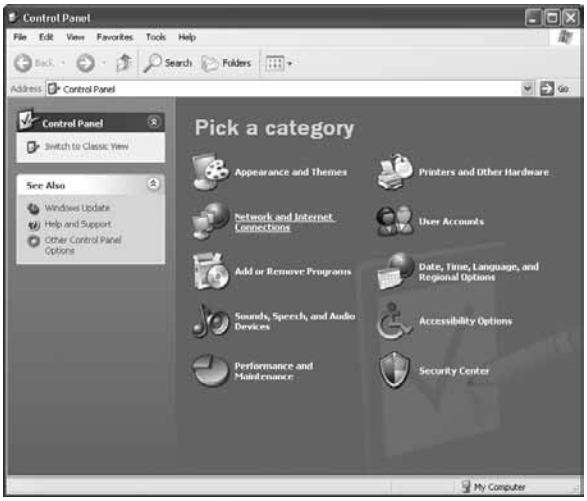
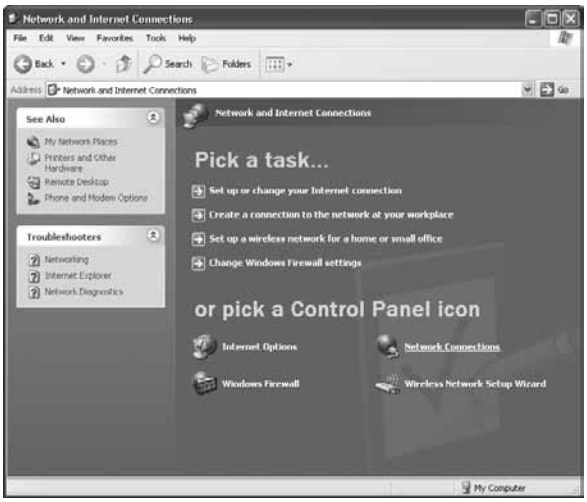
The following is a step by step guide to configure the PC IP address in Windows XP using either the classic or category viewing mode.

To access the network settings on a Windows XP based PC:

Category (Default) View:	Classic View:
[Start]	[Start]
[Control Panel]	[Settings]
[Network & Internet Connections]	[Control Panel]
[Network Connections]	[Network Connections]

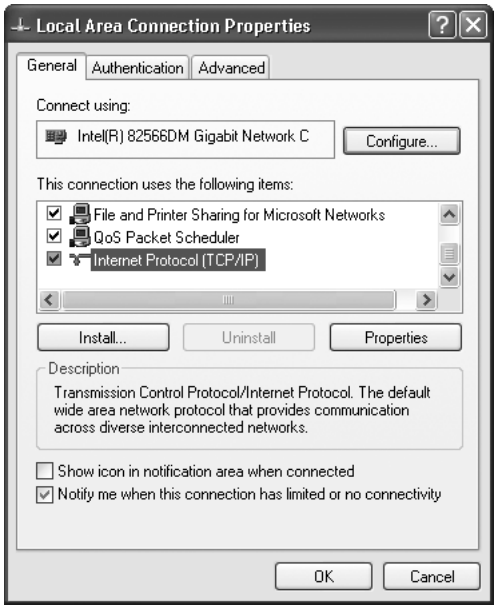
Start Menus - Windows XP	
Category (Default) View	Classic View
	

One of the following screens will be displayed, depending on the user's configuration of Windows XP software.

Control Panel Displays - Windows XP	
Category (Default) View	Classic View
	
	

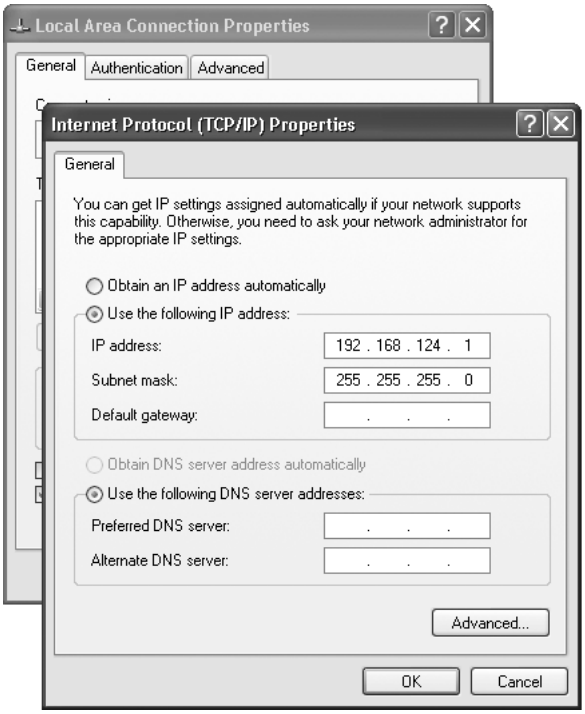
Regardless of the Windows XP viewing mode the following [Network Connections] screen will appear. Hereafter all configuration screens are the same regardless of selected Windows XP viewing mode.

Select the connection you wish configure. [Local Area Connection] is typically the standard or local Ethernet port on the PC (the port supplied with the PC), with any additional hardwire ports displayed as [Local Area Connection x] (with x being a numerical value). Double-click the icon for the port you wish to configure. The [Local Area Connection Properties] screen will appear.


Local Area Connection Properties
General Authentication Advanced
Connect using:
Intel(R) 82566DM Gigabit Network C
Configure...
This connection uses the following items:
File and Printer Sharing for Microsoft Networks
QoS Packet Scheduler
Internet Protocol (TCP/IP)
Install...
Uninstall
Properties
Description
Transmission Control Protocol/Internet Protocol. The default wide area network protocol that provides communication across diverse interconnected networks.
Show icon in notification area when connected
Notify me when this connection has limited or no connectivity
OK
Cancel

Use the vertical scroll bar on the right hand side of the screen to scroll down to the [Internet Protocol (TCP/IP)] option in the selection window. Select this option and click the [Properties] button. The [Internet Protocol (TCP/IP) Properties] screen will appear.

Select [Use the following IP address]. The IP address and Subnet mask text boxes can now be edited.


Local Area Connection Properties
General
Authentication
Advanced
Internet Protocol (TCP/IP) Properties
General
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
Obtain an IP address automatically
Use the following IP address:
IP address:
192 . 168 . 124 . 1
Subnet mask:
255 . 255 . 255 . 0
Default gateway:
Obtain DNS server address automatically
Use the following DNS server addresses:
Preferred DNS server:
Alternate DNS server:
Advanced...
OK
Cancel

Enter an IP address for the PC. This IP address will need to be unique to the PC (different to any other device on the network) but still allow communication on the same subnet that the drive is set to. To set up the PC IP address in this way enter the first three values of the IP address box to be identical to those set in IP_1, IP_2, and IP_3 parameters on the SMV drive. For the last value (IP_4) pick a unique value different to any other device on that network.

If the drive IP address has been left at its factory default value (192.168.124.16) then a logical IP address to assign to the PC might be 192.168.124.1

When exiting the IP address box the value in the subnet mask text box should default to 255.255.255.0. This value tells the PC that all other devices on the network share the same values for the first 3 Octets of their IP addresses with the last octet beginning unique to those devices. Typically the default value can be left unchanged unless a larger network needs to be specified.

NOTE

If the PC and drive need to obtain an IP address from a DHCP enabled server then the [Obtain an IP address automatically] option should remain ticked and no values should be present for either the IP address or subnet mask.

4.1.2 Configuring the SMVector Drive

Once the PC's IP address is configured, open up a standard web browser and enter the drive's IP address (default: 192.168.124.16) into the Address field. If the drive has been given a new IP address, then that IP address must be the one entered in the web browser. Press [Enter]. The SMVector Programming and Configuration page will open. The Commissioning menu on the left-hand side allows the user to navigate through and configure the drive setup and diagnostic parameters.

Table 4: Commissioning Menu Folders

	Folder				
	IP Settings		**Basic Setup**		**Get/Set Parameter**
Configurable Parameters	MAC Address		P100 (Start Control Source)		Parameter Number
	IP Address		P112 (Rotation)		Parameter Value
	Network Mask		P121 (TB-13A Input Function)		
	Gateway Address		P122 (TB-13B Input Function)		
	Multicast Address		P123 (TB-13C Input Function)		

In the [IP Settings] window, to select a new IP address, click [Write]. Type a value in the IP address octet windows. Then click [Apply Settings]. Power cycle the drive in order for the new IP address to take effect.

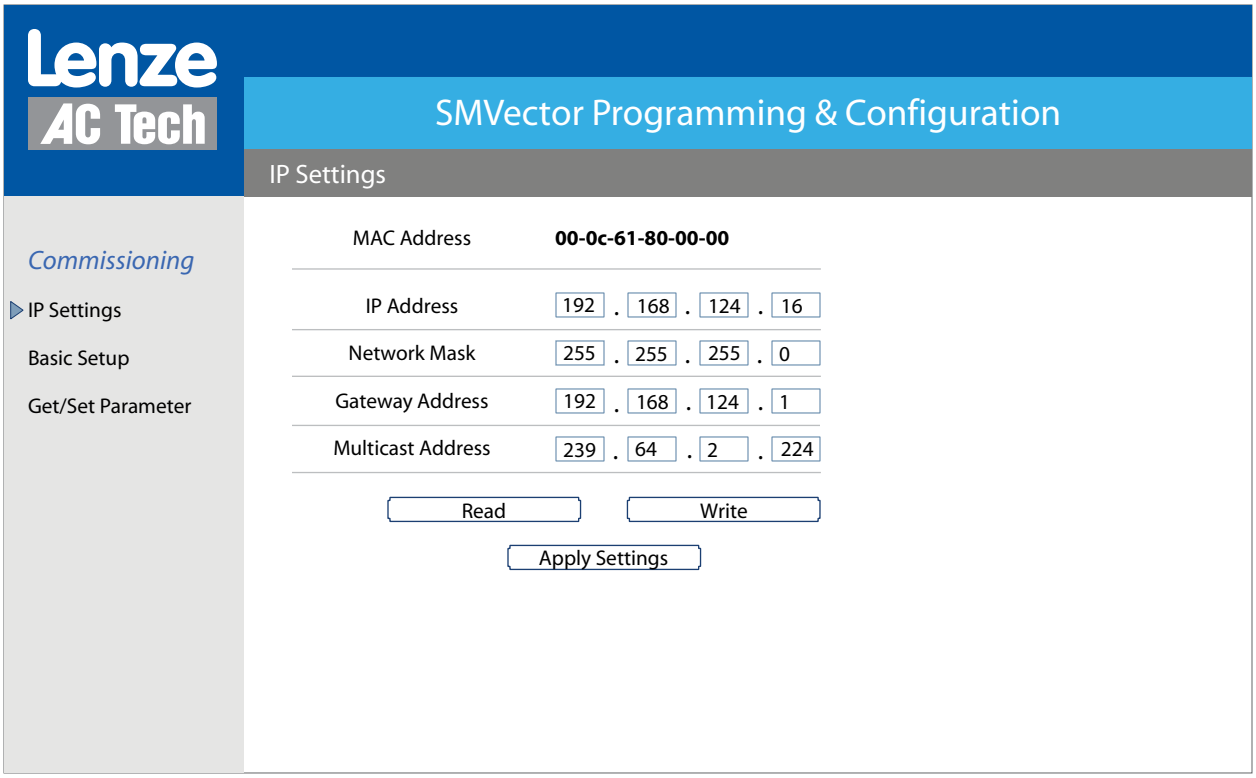


Figure 11: SMV Commissioning - IP Settings

WARNING!
Make sure it is safe to operate the driven equipment prior to starting the SMV drive from the network. Damage to equipment and/or injury to personnel can result.

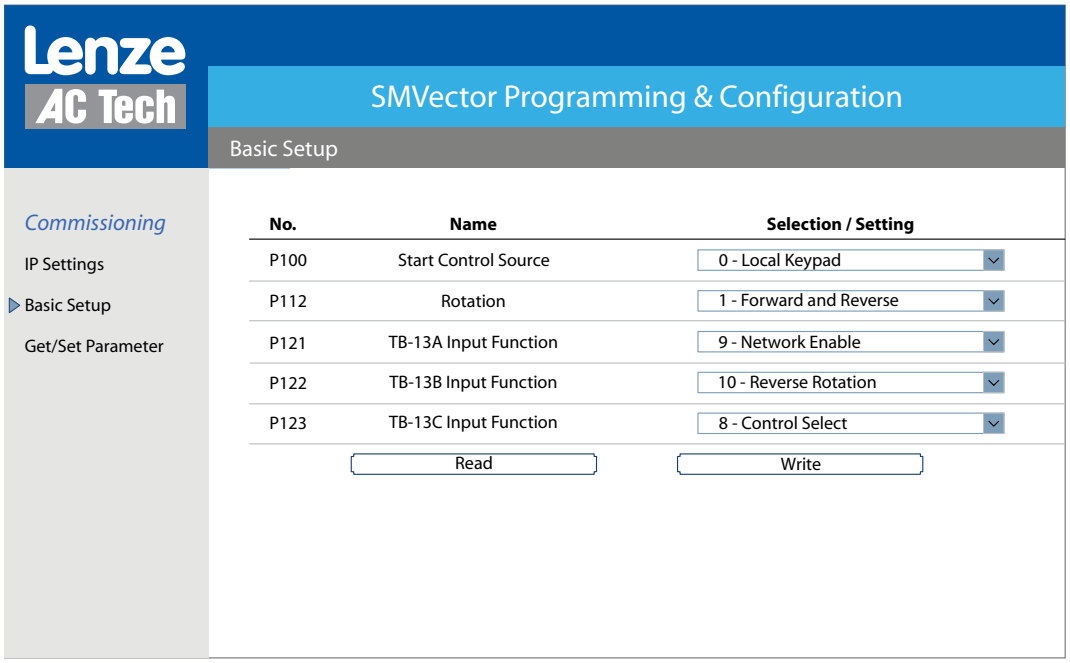


Figure 12: SMV Commissioning - Basic Setup

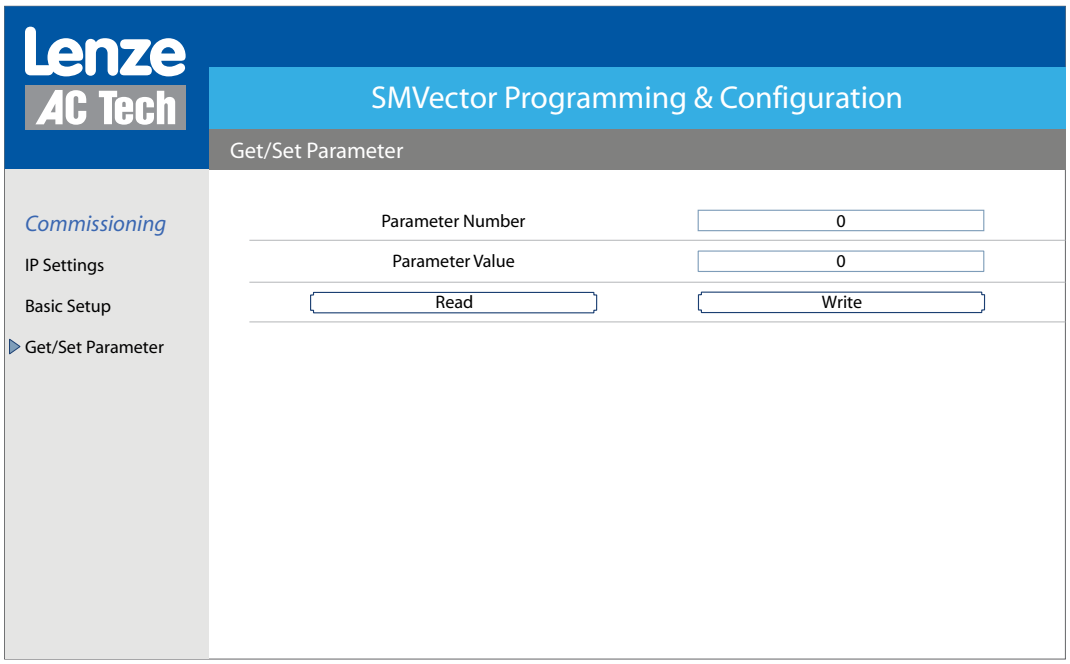


Figure 13: SMV Commissioning - Get/Set Parameter

The web server's write access ability can be disabled for security purposes by setting P492 to "1".

TIP!
To ensure that the drive is network control ready, open the Get/Set Parameter. Write a value of 97 to register 65 to start the drive. Write a value to P61 (ex 212 = 21.2Hz).Then write a value of 0 to 65 to stop the drive.

WARNING!
Make sure it is safe to operate the driven equipment prior to starting the SMV drive from the network. Damage to equipment and/or injury to personnel can result.

4.2 Configuring the SMV EtherNet/IP Module

4.2.1 Connecting

With the drive power disconnected install the EtherNet/IP module and connect the network cable as instructed in the preceeding sections. Ensure the drive Run / Enable terminal is disabled then apply the correct voltage to the drive (refer to the drive's user manual for voltage supply details).

4.2.2 Setting the Network Protocol

P400 - Network Protocol			
Default:	0	Range:	0 to 5
Access:	RW	Type:	Integer

Set P400 = 5 (Ethernet)

Some SMV option modules are capable of supporting multiple protocols; therefore it is necessary to set the required protocol. The option module is only initialised after a protocol has been selected.

4.2.3 IP Address

P410 - P413 IP Address			
Default:	192 168 124 16	Range:	0 - 255
Access:	RW	Type:	Integer

Set P410 - P413 to the required value. The default address is 192.168.124.16.

Each node on the network must have an individual address, if two of more nodes have duplicate addresses the network will not function correctly. After changing this setting, the drive must be power cycled in order for the new IP address to take effect.

4.2.4 Network Mask

P414 - P417 Network Mask			
Default:	255 255 255 0	Range:	0 - 255
Access:	RW	Type:	Integer

Set P414 - P417 to the required value. The default address is 255.255.255.0.

4.2.5 Gateway Address

P418 - P421 Gateway Address			
Default:	192 168 124 1	Range:	0 - 255
Access:	RW	Type:	Integer

Set P418 - P421 to the required value. The default address is 192.168.124.1.

4.2.6 Multicast Address

P422 - P425 Multicast Address			
Default:	239 64 2 224	Range:	0 - 255
Access:	RW	Type:	Integer

The EtherNet/IP Master sets the multicast address. If desired, this can be set manually using parameters P422 - P425. The default address is 239.64.2.224.

4.2.7 TTL Value

P426 TTL Value			
Default:	1	Range:	1 - 255
Access:	RW	Type:	Integer

Set P426 to the required value. The default TTL value is 1. The TTL value defines the number of hops the multicast message is allowed to propigate across routes. Consult your IT department for the proper setting for your particular network installation.

4.2.8 Configuration Control

P427 Configuration Control			
Default:	0	Range:	0, 1
Access:	RW	Type:	Integer

Set P427 to the required value. The default value is 0 (stored). A value of 1 = DHCP control.

4.2.9 Duplex Control

P428 Duplex Control			
Default:	1	Range:	0 - 1
Access:	RW	Type:	Integer

Set P428 to the required value. The default value is 1 (full duplex). A value of 0 = half duplex control.

4.2.10 Interface Speed Control

P429 - Interface Speed Control			
Default:	1	Range:	0 or 1
Access:	RW	Type:	Integer

The SMV EtherNet/IP module automatically detects and synchronises to the speed of the network to which it has been connected. The P429 value represents the detected speed: 1 = 100Mbps, 0 = 10Mbps speed.

4.2.11 Non-Module Parameter Settings

In addition to configuring the EtherNet/IP option module there are several drive based parameters that may need to be set. Such as:

- P100 - Start Control Source; network control is possible in any of the modes except mode 2 - “Remote Keypad Only”.
- P112 - Rotation; Used to enable either uni or bi direction rotation of the motor.
- **P121, 122 or 123 = 9**. One of the digital inputs **MUST** be assigned to mode 9 - “Network Control” and have the corresponding input closed to enable write access to the drive parameters and to perform any network control of the unit.

4.3 Configuring the Network Master

4.3.1 Master Support Files

Some EtherNet/IP master configuration software utilises Electronic Data Sheet (eds) files to configure the network profile and communications with the relevant devices. Some use this file for automatic tag generation. The SMV eds file is available on the CD ROM that ships with the module and on the Lenze-AC Tech website.

4.3.2 Configuring a Scanner or Bridge

To configure a simple network like the network illustrated in Figure 14, follow the steps in section 4.3.3. This example uses an Allen-Bradley 1769-L32E CompactLogix controller to communicate with SMV drives using implicit I/O messaging over an ethernet network. The controller has a scanner (bridge) that needs to be configured. The I/O assembly object instances will be used for status, input and output data and to map them in the controller memory.

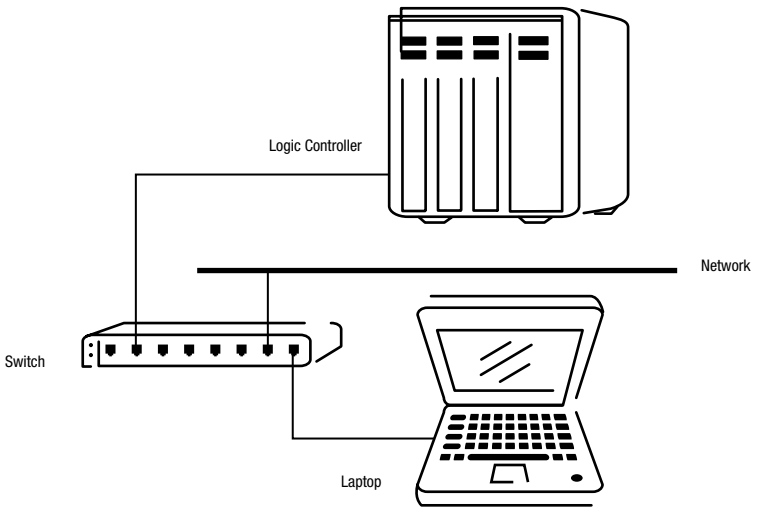


Figure 14: Example Network

4.3.3 Adding a Bridge or Scanner to the I/O Configuration

To establish communications over an EtherNet/IP network, add the controller and its scanner or bridge to the I/O configuration.

1. Start RSLogix 5000
   The RSLogix 5000 window opens as illustrated in Figure 14. For the CompactLogix L32E controller, the I/O configuration already includes a local Ethernet port.

   If a SoftLogic controller or ControlLogix controller is used then an Ethernet port scanner needs to be added as illustrated in Figure 15.

NOTE
The PLC must be **Offline** as shown in Figure 15, otherwise it is not possible to add the new module.

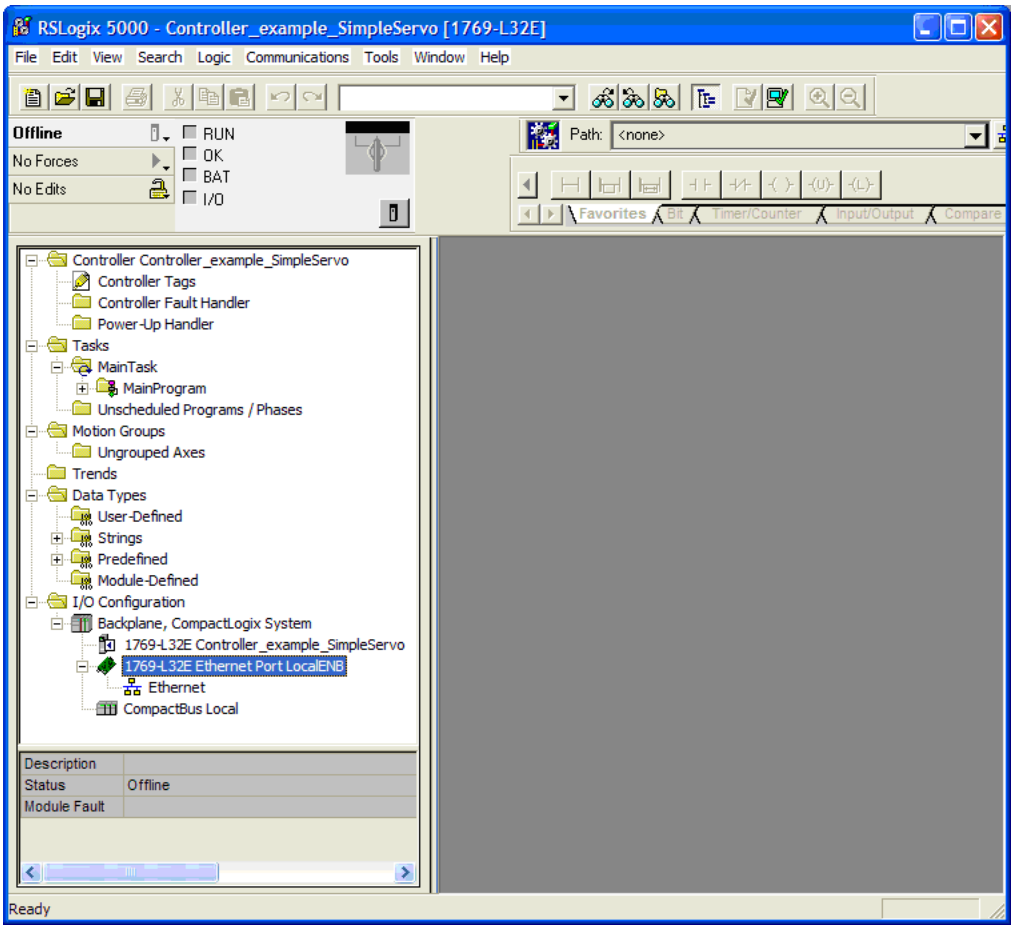


Figure 15: RSLogix 5000 Window (CompactLogix L32E)

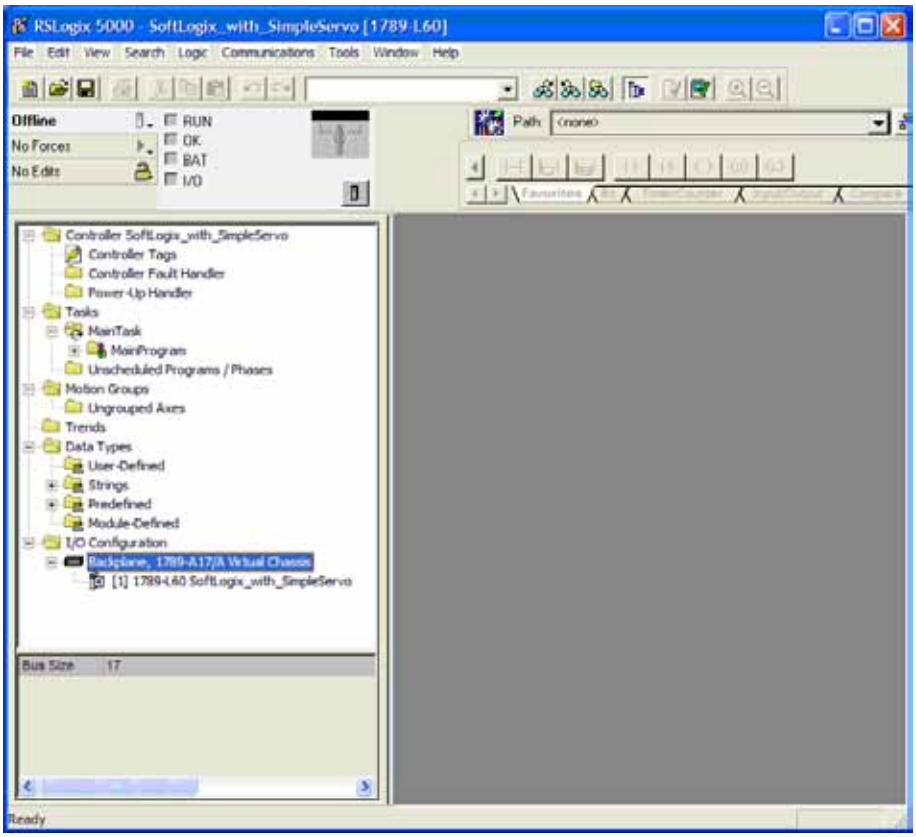


Figure 16: RSLogix 5000 Window (SoftLogix 5800)

2. For CompactLogix and SoftLogix only:

Right click on [Backplane, 1789-A17/A Virtual Chassis] to choose the Ethernet adapter.
Select [New module] and the “Select Module” dialog box will open.
Under the “By Category” tab, click the [+] icon to expand the [Communications] folder
Select the EtherNet/IP scanner or bridge used by your controller. (Ex SoftLogix5800 EtherNet/IP)
Then select the major revision of your controller’s firmware in the Major Revision box.

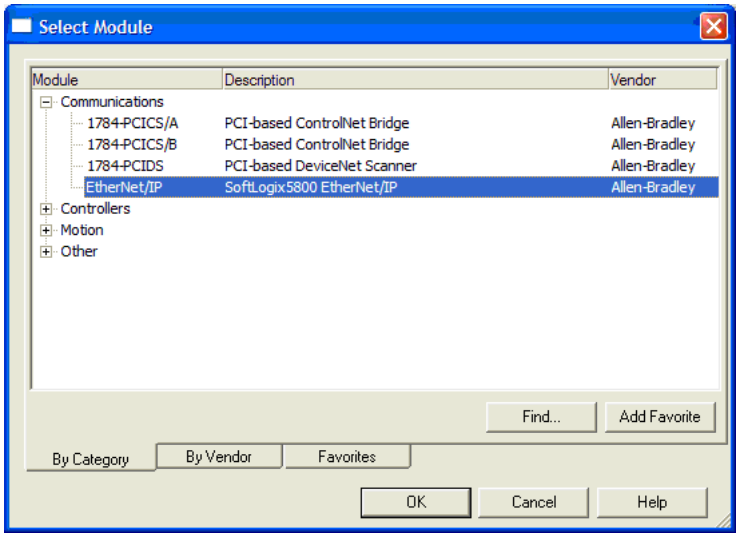


Figure 17: Ethernet Adapter selection (SoftLogix 5800)

3. Click [OK].

The Module Properties dialog box opens. For the CompactLogix controller, right click on [1769-L32E EthernetPort LocalENB] in I/O folder and then select “Properties”.

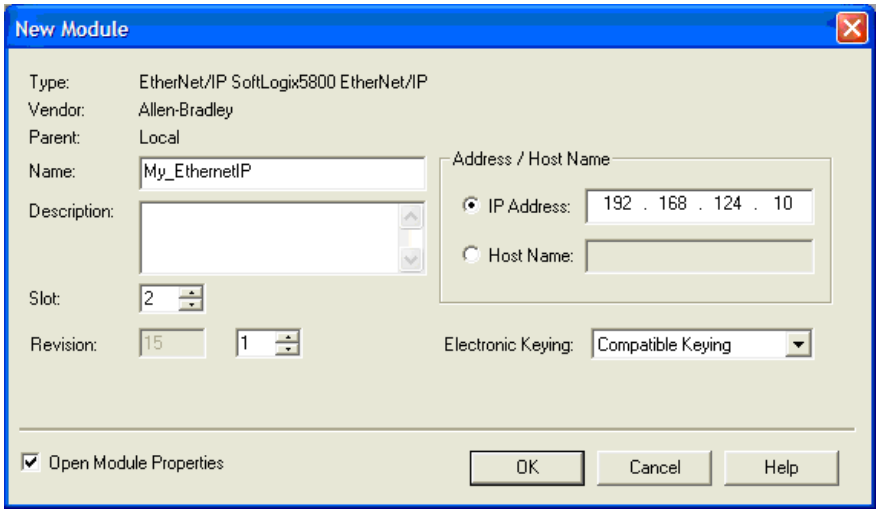


Figure 18: Ethernet Scanner Properties Setup (SoftLogix 5800)

4. Set the “New Module” properties using the information in Table 5.

Table 5: “New Module” Fields

Box	Type
Name	A name to identify the scanner or bridge.
Slot	The slot # of the EtherNet/IP scanner or bridge in the rack.
Revision	The minor revision of the firmware in the scanner. (You have already set the major revision in the Select Module Type dialog box)
IP Address	The IP address of the EtherNet/IP scanner or bridge.
Electronic Keying	**Compatible Module**. This setting for Electronic Keying ensures the physical module is consistent with the software configuration before the controller and scanner or bridge make a connection. Therefore, ensure that you have set the correct revision in this dialog box. Refer to the online Help if the controller and scanner have problems making a connection and you want to change this setting.

5. Click [OK] to finish.

The scanner (or bridge) is now configured for the EtherNet/IP network. Its name is now listed in the I/O Configuration folder.

5 Cyclic Data Access

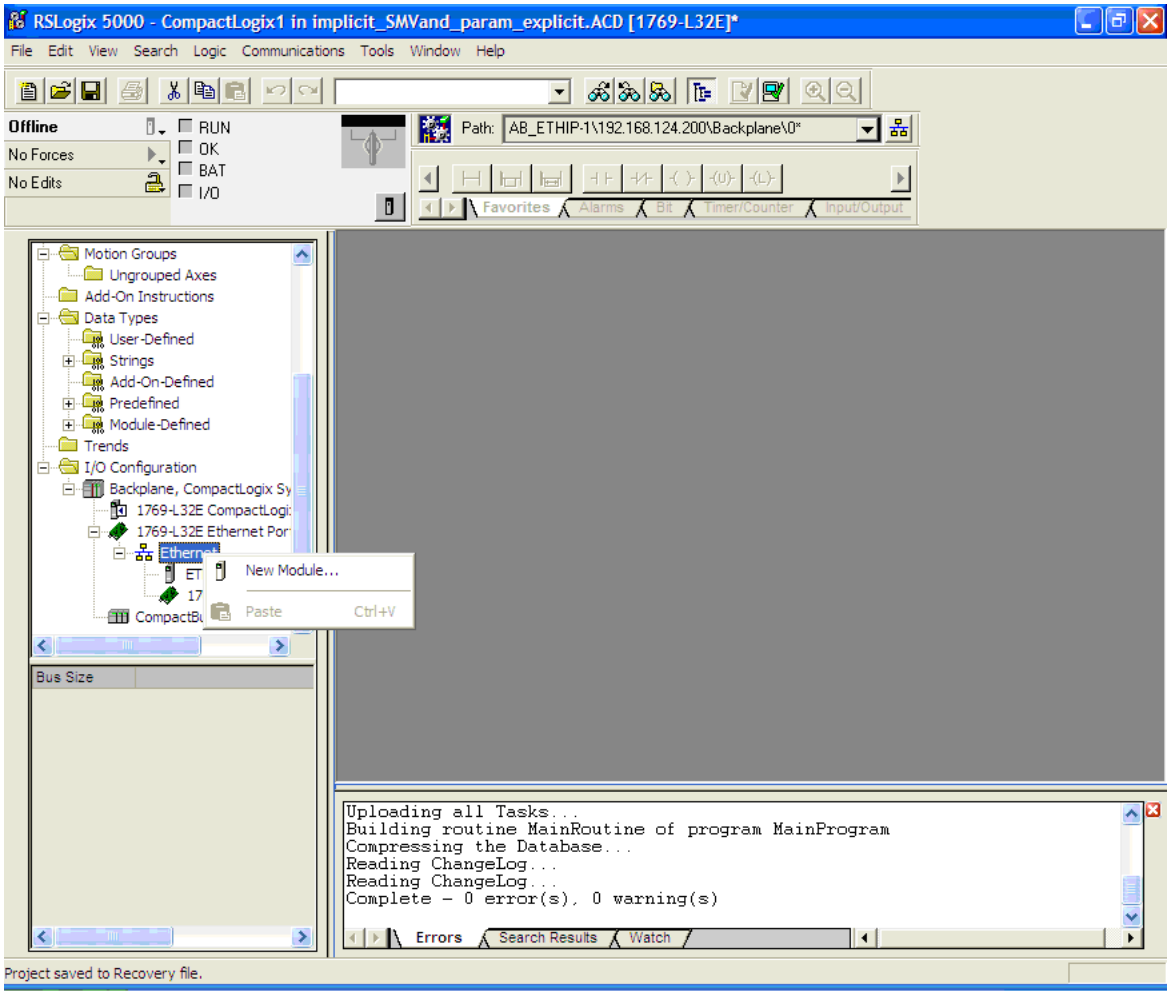
5.1 Implicit (I/O) Messaging

To map the drive to an Ethernet IP scanner in RSLogix 5000 for implicit messaging:

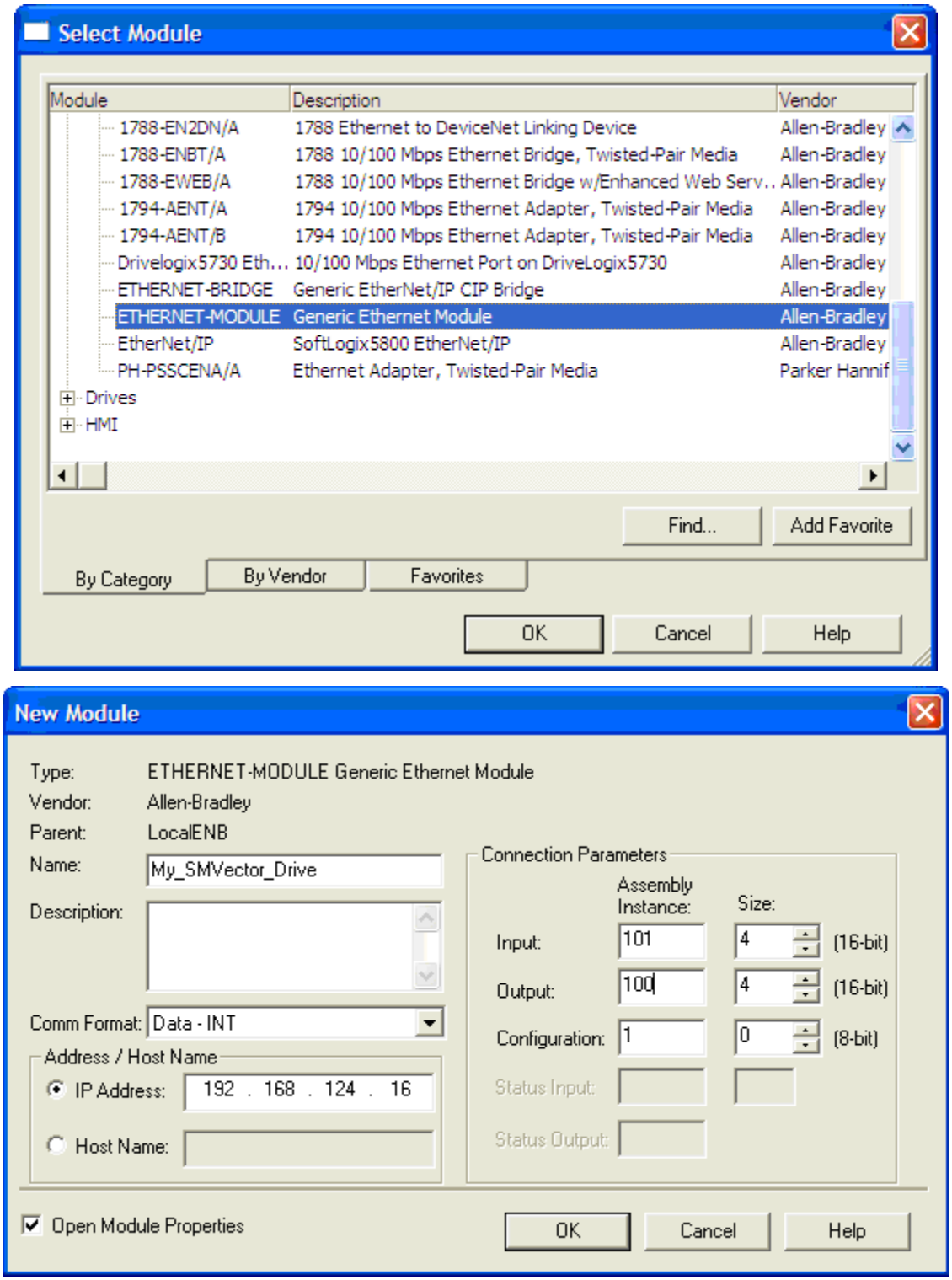
Click the [I/O Configuration] folder in the left-hand navigation window

Click the appropriate Ethernet Port folder, [1769-L32E Ethernet Port] in this example.

Right click on the [Ethernet] network icon and select [New Module].



Expand “Communications” and select [ETHERNET-MODULE Generic Ethernet Module].



Enter a name for the drive -usually relating to the process (i.e. booster_pump_4, or an equipment tag number such as PP105).

Enter the IP address of the SMV drive. Ensure that it is on the same subnet as the PLC (the first 3 octets of the IP address match).

For basic applications enter “Data – INT” for the Comm format.

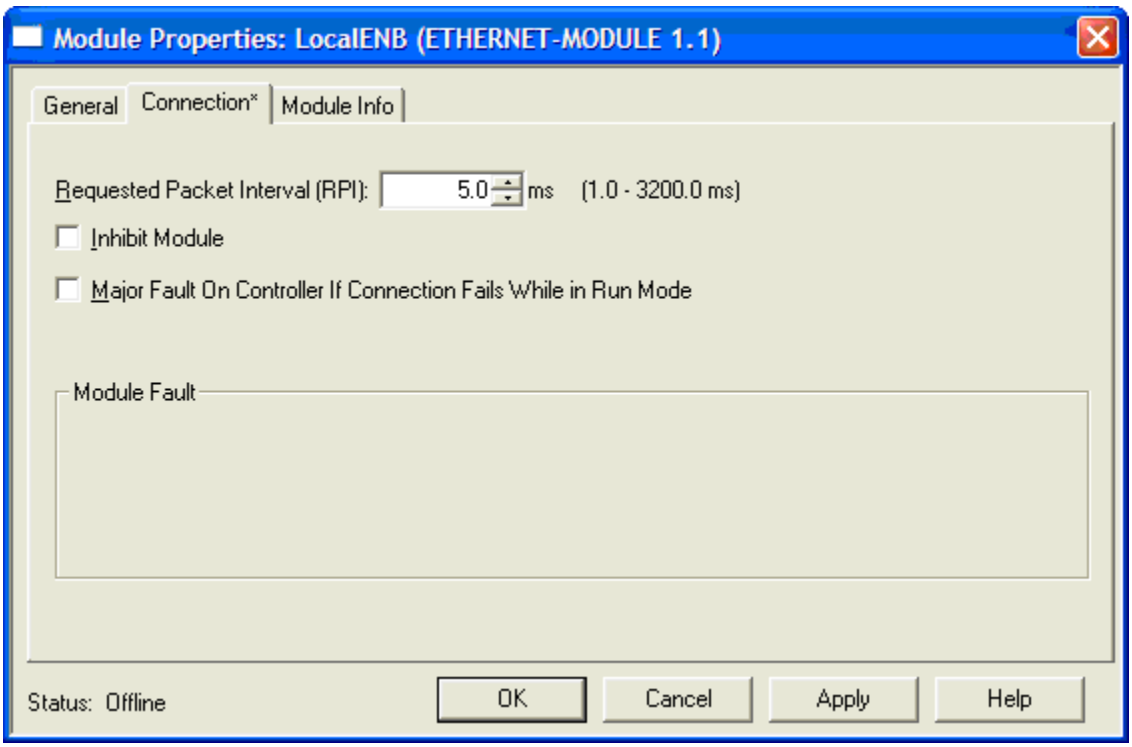
Enter the desired Input and Output Assembly numbers and their corresponding lengths. Remember the size must be set to the number of words that actually make up the assembly you want to use.

TIP! For most applications use Assemblies 101 (Input) and 100 (Output).

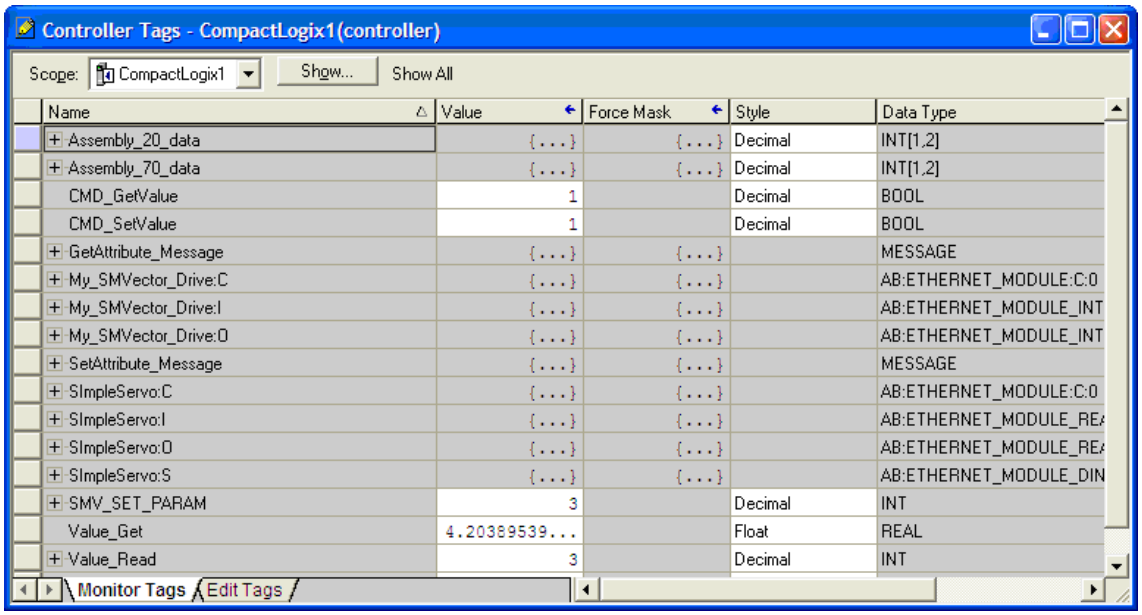
For Configuration enter assembly instance 1 and a size of 0. This value is required.

Under the connection tag enter the desired RPI rate. This is how frequently the drive will be polled by the PLC. The minimum recommended value is 5.0 milliseconds.

From this screen you can also optionally set the controller to fault if the Ethernet IP connection is lost to the drive while the controller is running. This selection is the [Major Fault On Controller If Connection Fails While in Run Mode].



The corresponding tags will then be created in the controller tags of the project as shown herein.



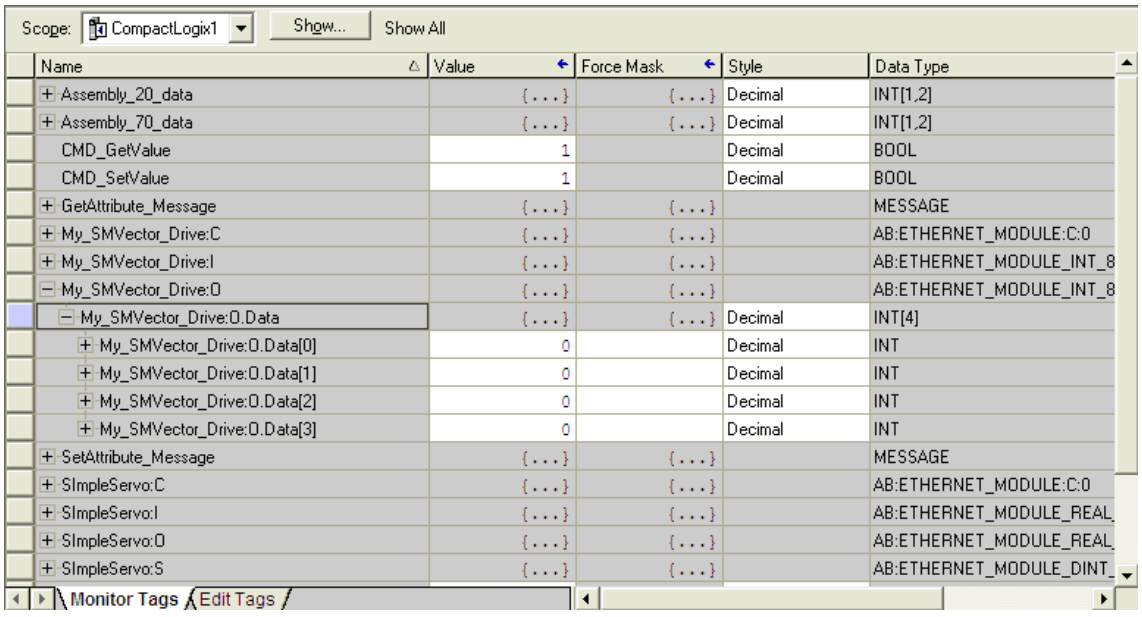
To understand this from the above configuration we named the drive “My_SMVector_Drive”. There are three sets of tags labeled “My_SMVector_Drive”:

[:C] for the Configuration assembly (1)

[:I] for the Input Assembly (101 in this example)

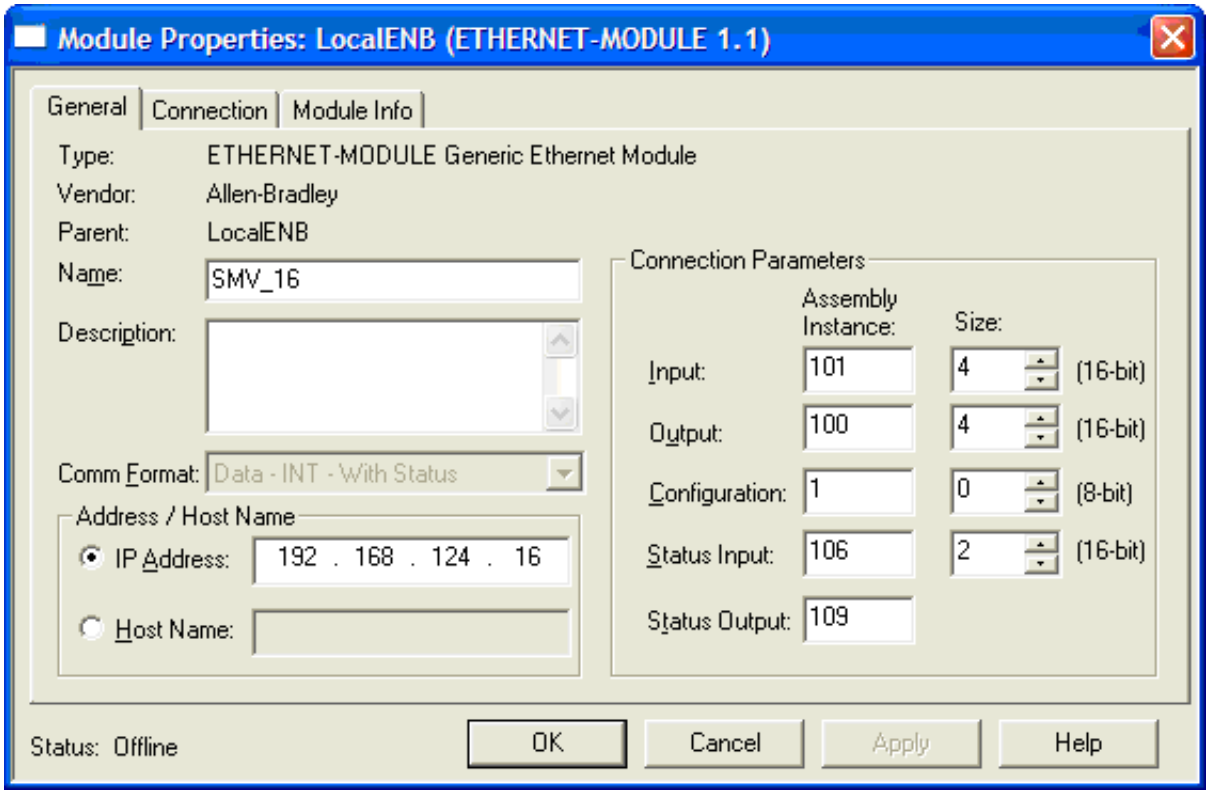
[:O] for the Output assembly (100 in this example)

Click on the [+] and expand the [My_SMVector_Drive:O] data to reveal all four words that make up the Output assembly.



To get more data from the drive, the user can optionally map the drive as “Data – INT- With Status” and map a second input assembly as Status Input (i.e. Assembly 106 shown in the following screenshot).

When this is done Status Output must be mapped to Assembly 109. This value is required



STOP!

The Status Input Assembly is limited to supporting two 16-bit words. The user can either use assembly 70, 71 or 106 for this purpose. If using Assembly 106 as the status input, the user **must** set the length to 2 and **must** set P452 and P453 to 0.

5.2 Implicit Messaging Timeout

It is often desirable to set a fault timeout condition to prevent the drive from operating in a runaway condition or loss of communications. To do this while controlling the drive via implicit messaging, set P431, P432 and P434 to 0. Set the timeout period desired (in milliseconds) in P435.

5.3 Saving the Configuration

After adding the scanner (or bridge) and the adapter to the I/O configuration, the configuration must be downloaded to the controller. The configuration should also be saved to a file on your computer.

1. On the top toolbar, click [Communications] then select [Download] from the pull down menu. The Download dialog box will open.

NOTE

If a message box reports that RSLogix is unable to go online, then select 'Communications Who Active' to try and find your controller in the 'Who Active' dialog box. If the controller is not shown, then the Ethernet/IP driver needs to be added or configured in RSLinx. Refer to the RSLinx online help.

2. Click [Download] to download the configuration to the controller. When the download is successfully completed, RSLogix enters online mode and the I/O OK box in the upper-left part of the screen is green.

3. On the top toolbar, click [File] then select [Save] from the pull down menu. If this is the first time the project is saved, then the [Save As] dialog box will open. Navigate to a folder, type a file name and then click [Save] to save the configuration to a file on your computer.

5.4 I/O Assemblies

SMV Ethernet/IP implementation supports the I/O assembly object class 0x04. SMV assemblies are static. There are several Input and Output pre-defined assemblies (assembly object instances) that can be used for data exchange. The terms Input and Output refer to the point of view of the scanner. Output data is produced by the scanner and consumed by the adapter. Input data is produced by the adapter and consumed by the scanner. The SMV is always an adapter device. Depending on the assembly number the memory map of the data can have a different size and meaning.

5.4.1 Important Note on Input Assemblies

Input assemblies (adapter to scanner) are mapped to the adapter memory from byte 0. There is no preceding 4 byte header like that found in most Allen-Bradley equipment. The SMVector does not use preceding header functionality for real time status. So the start address in the assembly memory map is the actual start of the 1st assembly data item. The user should supply the actual assembly length when mapping the input assembly to the controller memory.

5.4.2 Important Note on Output Assemblies

Output assemblies (scanner to adapter) are assumed to have the preceding 4 byte header. When mapping the assembly this header will automatically be added to the data stream by most AB PLC/CLC equipment. If you use equipment other than AB for the scanner, configure it to send the 4 byte header preceding the actual assembly data. The data in the header should be set to 0.

5.5 Using Assemblies for Control and Status/Data Monitoring

Output assemblies are commonly used for controlling the enable/disable state of the drive and for supplying the velocity or torque reference. Input assemblies are commonly used to monitor the drive status and run-time quantities such as current velocity, current, actual position and position error. The recommended configurations for I/O assemblies are:

Configuration assembly:	use assembly 1 with size 0
Status Output assembly:	use assembly 109
Status Input assembly:	use assembly 70, 71 or 106; size of assembly must match the actual size of the assembly. In case of CompactLogix it must be 2 x 16bit.

5.6 Output Assemblies

5.6.1 Output Assembly 20 - Basic Speed Control

Word 0	Bit 0	0 = NOT Run Forward 1 = Run Forward
	Bit 1	Reserved
	Bit 2	Fault reset on transition from 0 to 1
	Bit 3	Reserved
	Bit 4	Reserved
	Bit 5	Reserved
	Bit 6	Reserved
	Bit 7	Reserved
	Bit 8	Reserved
	Bit 9	Reserved
	Bit 10	Reserved
	Bit 11	Reserved
	Bit 12	Reserved
	Bit 13	Reserved
	Bit 14	Reserved
	Bit 15	Reserved
Word 1	Speed in RPMs (max 32767) • RPM is calculated based on P305 and P304 • Example 1 (P305 = 1750 RPM, P304 = 60 Hz): Requested speed command 25.0 Hz = 25.0 x 1750/60 = 729 = 0x02D9	

NOTE
To use this Output assembly (20) Network Control and Network Reference must be set using explicit communication by writing into the control word at NetId 65 – the bit configuration of this word matches the WORD 0 of output assembly 100.

5.6.2 Output Assembly 21 - Extended Speed Control

Word 0	Bit 0	0 = NOT Run Forward 1 = Run Forward
	Bit 1	0 = NOT Run Reverse 1 = Run Reverse
	Bit 2	Fault reset on transition from 0 to 1
	Bit 3	Reserved
	Bit 4	Reserved
	Bit 5	0 = Local Control 1 = Network Control
	Bit 6	0 = Local Speed reference 1 = Network Speed reference
	Bit 7	Reserved
	Bit 8	Reserved
	Bit 9	Reserved
	Bit 10	Reserved
	Bit 11	Reserved
	Bit 12	Reserved
	Bit 13	Reserved
	Bit 14	Reserved
	Bit 15	Reserved
Word 1	Speed in RPMs (max 32767) • RPM is calculated based on P305 and P304 • Example 1 (P305 = 1750 RPM, P304 = 60 Hz): Requested speed command 25.0 Hz = 25.0 x 1750/60 = 729 = 0x02D9	

NOTE
In order to Start/Stop the drive via network control, bit 5 of Word 0 must be set in this assembly.
In order to control the speed via network communications, bit 6 of Word 0 must be set in this assembly.

5.6.3 Output Assembly 100 - Speed (Hz) & Digital and Analog Output

Word 0	Bit 0	0 = NOT Run Forward 1 = Run Forward			
	Bit 1	0 = NOT Run Reverse 1 = Run Reverse			
	Bit 2	Fault reset on transition from 0 to 1			
	Bit 3	Reserved			
	Bit 4	Reserved			
	Bit 5	0 = Local Control 1 = Network Control			
	Bit 6	0 = Local Speed reference 1 = Network Speed reference			
	Bit 7	Reserved			
	Bit 8 Bit 9 Bit 10 Bit 11	Network Speed reference (valid when bit 6 set) 0 – Network 1 – keypad 2 – 0-10VDC	3 – 4-20mA 4 – Preset #1 5 – Preset #2	6 – Preset #3 7 – Preset #4 8 – Preset #5	9 – Preset #6 10 – Preset #7 11 – MOP
	Bit 12	0 = No Action 1 = Inhibit (Coast to STOP)			
	Bit 13	0 = No Action 1 = Activate Quick STOP			
	Bit 14	0 = No Action 1 = Force Manual Mode (active only in Network Control, in PID mode will force open loop)			
	Bit 15	0 = DC brake active 1 = DC brake NOT active			
Word 1	Unsigned speed 0.1Hz resolution • received value = 0x01F0 = 49.6Hz				
Word 2	Digital Output + Relay – Active when parameter P140, P142 = 25 Network Control Bit 9 – Open Collector Bit 10 - Relay Others – reserved for future use				
Word 3	Analog Output [0.01VDC] – Active when parameter P150 = 9 Network Control • received value = 0x024B = 5.87[VDC]				

NOTE
In order to Start/Stop the drive via network control, bit 5 of Word 0 must be set in this assembly.
In order to control the speed via network communications, bit 6 of Word 0 must be set in this assembly.

5.6.4 Output Assembly 102 - PID Setpoint & Digital and Analog Output

Word 0	Bit 0	0 = NOT Run Forward 1 = Run Forward			
	Bit 1	0 = NOT Run Reverse 1 = Run Reverse			
	Bit 2	Fault reset on transition from 0 to 1			
	Bit 3	Reserved			
	Bit 4	Reserved			
	Bit 5	0 = Local Control 1 = Network Control			
	Bit 6	0 = Local Speed reference 1 = Network Speed reference			
	Bit 7	Reserved			
	Bit 8 Bit 9 Bit 10 Bit 11	Network Speed reference (valid when bit 6 set) 0 – Network 1 – keypad 2 – 0-10VDC	3 – 4-20mA 4 – Preset #1 5 – Preset #2	6 – Preset #3 7 – Preset #4 8 – Preset #5	9 – Preset #6 10 – Preset #7 11 – MOP
	Bit 12	0 = No Action 1 = Inhibit (Coast to STOP)			
	Bit 13	0 = No Action 1 = Activate Quick STOP			
	Bit 14	0 = No Action 1 = Force Manual Mode (active only in Network Control, in PID mode will force open loop)			
	Bit 15	0 = DC brake active 1 = DC brake NOT active			
Word 1	Network PID setpoint Signed value -999 … 31000				
Word 2	Digital Output + Relay – Active when parameter P140,P142 = 25 Network Control Bit 9 – Open Collector Bit 10 - Relay Others – reserved for future use				
Word 3	Analog Output [0.01VDC] – Active when parameter P150 = 9 Network Control • received value = 0x024B = 5.87[VDC]				

NOTE
In order to Start/Stop the drive via network control, bit 5 of Word 0 must be set in this assembly.
In order to control the speed via network communications, bit 6 of Word 0 must be set in this assembly.

5.6.5 Output Assembly 104 - Torque Setpoint & Digital and Analog Output

Word 0	Bit 0	0 = NOT Run Forward 1 = Run Forward			
	Bit 1	0 = NOT Run Reverse 1 = Run Reverse			
	Bit 2	Fault reset on transition from 0 to 1			
	Bit 3	Reserved			
	Bit 4	Reserved			
	Bit 5	0 = Local Control 1 = Network Control			
	Bit 6	0 = Local Speed reference 1 = Network Speed reference			
	Bit 7	Reserved			
	Bit 8 Bit 9 Bit 10 Bit 11	Network Speed reference (valid when bit 6 set) 0 – Network 1 – keypad 2 – 0-10VDC	3 – 4-20mA 4 – Preset #1 5 – Preset #2	6 – Preset #3 7 – Preset #4 8 – Preset #5	9 – Preset #6 10 – Preset #7 11 – MOP
	Bit 12	0 = No Action 1 = Inhibit (Coast to STOP)			
	Bit 13	0 = No Action 1 = Activate Quick STOP			
	Bit 14	0 = No Action 1 = Force Manual Mode (active only in Network Control, in PID mode will force open loop)			
	Bit 15	0 = DC brake active 1 = DC brake NOT active			
Word 1	Unsigned Torque Setpoint 0 – 400% limited by parameter P330 Torque Limit				
Word 2	Digital Output + Relay – Active when parameter P140,P142 = 25 Network Control Bit 9 – Open Collector Bit 10 - Relay Others – reserved for future use				
Word 3	Analog Output [0.01VDC] – Active when parameter P150 = 9 Network Control • received value = 0x024B = 5.87[VDC]				

NOTE
In order to Start/Stop the drive via network control, bit 5 of Word 0 must be set in this assembly.
In order to control the speed via network communications, bit 6 of Word 0 must be set in this assembly.

5.6.6 Output Assembly 107 - Custom Selectable

Word 0	Data transferred to register/Id specified in parameter P440	Valid selections: 0 – Disabled/Not evaluated. 1 – SMV Control Word 2 – Network command Frequency 3 – Lenze C135 Control Word 4 – Network Speed in unsigned RPM 5 – Network PID Setpoint 6 – Network Torque Setpoint 7 – Network Speed in signed RPMs (control direction) 8 – Digital Outputs 9 – Analog Output
Word 1	Data transferred to register/Id specified in parameter P441	
Word 2	Data transferred to register/Id specified in parameter P442	
Word 3	Data transferred to register/Id specified in parameter P443	

FOR EXAMPLE: Setting the P440 to 1 will place the value of received output assembly WORD 0 into the SMV control Word.

NOTE
Last value not equal to zero in parameters P440 to P443 defines the end of Assembly 107.
For example: P440 = 0; P441=2; P442=4; P443=0. Last value not equal zero is in parameter P442. That defines output assembly 107 as a 3 words (6 bytes) long with WORD 0 (P440 = 0) not being evaluated

Output Assembly 107 options

- P44x = 1, SMV Control Word
- P44x = 2, Network Frequency Setpoint
- P44x = 3, Lenze C135 Control Word
- P44x = 4 or 7, Network Speed Setpoint
- P44x = 5, Network PID Setpoint
- P44x = 6, Network Torque Setpoint
- P44x = 8, Network Digital I/O Control Word
- P44x = 9, Network Analog I/O Control Value

5.6.6.1 P44x = 1, SMV Control Word

The SMV Control Word consists of 16 control bits some of which are reserved.

Table 6: SMV Control Word

b15	b14	b13	b12	b11	b10	b9	b8
DC Braking	PID Disable	Quick Stop	Controller Inhibit	Network Setpoint Reference Source			
b7	**b6**	**b5**	**b4**	**b3**	**b2**	**b1**	**b0**
Reserved	Network Reference Enable	Network Control Enable	Reserved	Reserved	Fault Reset	Run Reverse	Run Forward

Table 7: SMV Control Word BIT Functions

BIT	Function	Description
0	Run Forward	Set to 1 to run the motor in the FORWARD direction.
1	Run Reverse	Set to 1 to run the motor in the REVERSE direction.
2	Fault Reset	A 0-to-1 transition will reset the drive from a trip condition.
3	Reserved	
4	Reserved	
5	Network Control Enable	0 = Local Control 1 = Network Control
6	Network Reference Enable	0 = Local Speed Reference 1 = Network Speed Reference
7	Reserved	
8 9 10 11	Network Setpoint Reference Source	0 = Network, 4 = Preset #1, 8 = Preset #5 1 = Keypad, 5 = Preset #2, 9 = Preset #6 2 = 0-10VDC, 6 = Preset #3, 10 = Preset #7 3 = 4-20mA, 7 = Preset #4, 11 = MOP
12	Controller Inhibit	Set to 1 to disable the drive and allow the motor to coast to a stop
13	Quick Stop	Set to 1 to disable the drive and stop the ramp time defined in P127
14	PID Disable	When using PID mode, setting this bit (14) to 1 will disable PID control. (Active only in Network Control)
15	DC Braking	Set to 1 to activate DC injection braking. Refer to P174 for details.

If the SMV Control Word is used, the RUN and STOP commands are controlled as listed in Table 8.

Table 8: SMV Control Word RUN and STOP Events

BIT 0 - RUN FWD	BIT 1 - RUN REV	Action
0	0	STOP Method (Refer to P111)
0 -> 1	0	RUN FORWARD
0	0 -> 1	RUN REVERSE
0 -> 1	0 -> 1	NO ACTION / remains in last state
1	1	NO ACTION / remains in last state
1 -> 0	1	RUN REVERSE
1	1 -> 0	RUN FORWARD

NOTE
If P112 (ROTATION) is set to FORWARD ONLY, the drive will not be able to run in the reverse direction.
For absolute clarity: "0 -> 1" is the transition from 0 to 1 and "1 -> 0" is the transition from 1 to 0

5.6.6.2 P44x = 2, Network Frequency Setpoint

The Network Frequency Setpoint is represented as an unsigned Hz value. This mapping along with the use of the correct Control Word Bits allows the drive frequency setpoint to be controlled from the network. This mapping function uses unsigned scaled integer values. Example:

- Frequency Setpoint value to be transmitted from the network master = 33.5Hz.
- The actual value transmitted to the drive must be 335 (0x014F).

5.6.6.3 P44x = 3, Lenze C135 Control Word

The Lenze C135 Control Word consists of 16 control bits some of which are reserved.

Table 9: Lenze C135 Control Word

b15	b14	b13	b12	b11	b10	b9	b8
Network Ref Enable	DC Braking	Reserved	Reserved	Fault Reset	Reserved	Controller Inhibit	Network CTRL Enable
b7	**b6**	**b5**	**b4**	**b3**	**b2**	**b1**	**b0**
Reserved	Reserved	Reserved	Reserved	Quick Stop	Direction of Rotation	Network Setpoint Reference	

Table 10: Lenze C135 Control Word BIT Functions

BIT	Function	Description		
0	Network Setpoint Reference Source	0 = Network 1 = Preset #1	2 = Preset #2 3 = Preset #3	(Active only when Network Reference is Enabled)
1				
2	Direction of Rotation	0 = CW (FORWARD)		1 = CCW (REVERSE)
3	Quick Stop	Set to 1 to disable the drive and stop the ramp time defined in P127		
4 - 7	Reserved			
8	Network Control Enable	0 = Local Control		1 = Network Control
9	Controller Inhibit	Set to 1 to disable the drive and allow the motor to coast to a stop		
10	Reserved			
11	Fault Reset	A 0-to-1 transition will reset the drive from a trip condition. If the reason for the trip is still present or another fault condition has been detected, the drive will immediately trip again. When resetting the drive, it is recommended to check the status word to ensure that the reset was successful, before attempting to restart the drive.		
12 - 13	Reserved			
14	DC Braking	Set to 1 to activate DC injection braking. Refer tp P174 & 175 for details.		
15	Network Reference Enable	0 = Local Speed Reference		1 = Network Speed Reference

5.6.6.4 P44x = 4 or 7, Network Speed Setpoint

When P44x = 4, the Network Speed Setpoint is represented as an unsigned rpm value.

When P44x = 7, the Network Speed Setpoint is represented as a signed rpm value, Direction Control

Using one of these mappings along with the use of the correct Control Word Bits allows the drive speed setpoint to be controlled from the network.

NOTE
While the values used do not have to be scaled for data transmission, RPM scaling is based on P304 Motor Rated Frequency and P305 Motor Rated Speed.
Example: If P304 = 60Hz; P305 = 1750 RPM,
then request setpoint forward (CW) at 25.0 HZ = 25.0 x 1750/60 = 729 = 0x02D9

Example 1:

- P44x = 4
- Speed Setpoint value to be transmitted from the network master = 750rpm.
- The actual value transmitted to the drive must be 750 (0x02EE).

Example 2:

- P44x = 7
- Speed Setpoint value to be transmitted from the network master = +750rpm.
- The actual value transmitted to the drive must be 750 (0x02EE).
- Speed Setpoint value to be transmitted from the network master = -333rpm.
- The actual value transmitted to the drive must be -333 (0xFEB3).
- If Reverse Direction is enabled, the drive will reverse as appropriate.

5.6.6.5 P44x = 5, Network PID Setpoint

The Network PID Setpoint is represented as a signed PID value in the range from -999 to 31000.

This mapping along with the use of the correct Control Word Bits allows the drive PID setpoint (when in PID mode) to be controlled from the network.

5.6.6.6 P44x = 6, Network Torque Setpoint

The Network Torque Setpoint is represented as an unsigned percent value in the range from 0 to 400%.

This mapping along with the use of the correct Control Word Bits allows the drive torque setpoint (when in torque mode) to be controlled from the network. The maximum torque value is 400%, however P330 can be used to apply an overriding torque limit.

5.6.6.7 P44x = 8, Network Digital I/O Control Word

To utilise the drive's digital output and relay functions directly from the network master, set:

- P140 = 25 - Relay Network Controlled
- P142 = 25 - Digital Output Network Controlled

The Digital I/O Control Word consists of 16 control bits some of which are reserved.

Table 11: Digital I/O Control Word

b15	b14	b13	b12	b11	b10	b9	b8
Reserved	Reserved	Reserved	Reserved	Reserved	Activate Relay	Activate Digital Output	Reserved
b7	**b6**	**b5**	**b4**	**b3**	**b2**	**b1**	**b0**
Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved

5.6.6.8 P44x = 9, Network Analog I/O Control Value

To utilise the drive's analog output directly from the network master set:

- P150 = 9 - Analog Output Network Controlled

This mapping function uses an unsigned scaled integer value.

Example:

- Analog value to be transmitted from the network master = 5.78V.
- The actual value transmitted to the drive must be 578 (0x024B).

5.7 Input Assemblies

5.7.1 Input Assembly 70 - Basic Speed Control

Word 0	Bit 0	1 = Faulted
	Bit 1	Reserved
	Bit 2	1 = Running Forward
	Bit 3	Reserved
	Bit 4	Reserved
	Bit 5	Reserved
	Bit 6	Reserved
	Bit 7	Reserved
	Bit 8	Reserved
	Bit 9	Reserved
	Bit 10	Reserved
	Bit 11	Reserved
	Bit 12	Reserved
	Bit 13	Reserved
	Bit 14	Reserved
	Bit 15	Reserved
Word 1	• Actual Speed in RPMs • RPM is calculated based on P305 and P304 • Example 1 (P305 = 1750 RPM, P304 = 60 Hz): Frequency at 25.0 Hz = 25.0 x 1750/60.0 = 729 = 0x02D9	

5.7.2 Input Assembly 71 - Extended Speed Control

Word 0	Bit 0	1 = Faulted
	Bit 1	Reserved
	Bit 2	1 = Running Forward
	Bit 3	1 = Running Reverse
	Bit 4	1 = Ready
	Bit 5	0 = Local Control 1 = Control from Network
	Bit 6	0 = Local reference 1 = Reference from Network
	Bit 7	1 = At reference
	Bit 8	Reserved
	Bit 9	Reserved
	Bit 10	Reserved
	Bit 11	Reserved
	Bit 12	Reserved
	Bit 13	Reserved
	Bit 14	Reserved
	Bit 15	Reserved
Word 1	• Actual Speed in RPMs • RPM is calculated based on P305 and P304 • Example 1 (P305 = 1750 RPM, P304 = 60 Hz): Frequency at 40.0 Hz = 40.0 x 1750/60.0 = 1166 = 0x048E	

5.7.3 Input Assembly 101 - Speed (Hz) & Digital and Analog Input

Word 0	Bit 0	1 = Faulted
	Bit 1	Reserved
	Bit 2	1 = Running Forward
	Bit 3	1= Running Reverse
	Bit 4	1 = Ready
	Bit 5	0 = Local Control 1 = Control from Network
	Bit 6	0 = Local reference 1 = Reference from Network
	Bit 7	1 = At reference
	Bit 8 Bit 9 Bit 10 Bit 11	Actual set point source: 0 – keypad, 3 – Preset #1, 6 – Preset #4, 9 – Preset #7 1 – 0-10VDC, 4 – Preset #2, 7 – Preset #5, 10 – MOP 2 – 4-20mA, 5 – Preset #3, 8 – Preset #6, 11 – Network
	Bit 12	1 = PID Active (closed loop)
	Bit 13	1 = Torque mode active
	Bit 14	1 = Current limit
	Bit 15	1 = DC Braking
Word 1	Unsigned actual frequency 0.1Hz resolution.	
Word 2	Digital Input/Output states (See Note 1 for details)	
Word 3	Analog Input 0-10V TB [0.01VDC] • received value = 0x024B = 5.87[VDC]	

5.7.4 Input Assembly 103 - Speed (Hz) & Actual PID Setpoint and Feedback

Word 0	Bit 0	1 = Faulted
	Bit 1	Reserved
	Bit 2	1 = Running Forward
	Bit 3	1= Running Reverse
	Bit 4	1 = Ready
	Bit 5	0 = Local Control 1 = Control from Network
	Bit 6	0 = Local reference 1 = Reference from Network
	Bit 7	1 = At reference
	Bit 8 Bit 9 Bit 10 Bit 11	Actual set point source: 0 – keypad, 3 – Preset #1, 6 – Preset #4, 9 – Preset #7 1 – 0-10VDC, 4 – Preset #2, 7 – Preset #5, 10 – MOP 2 – 4-20mA, 5 – Preset #3, 8 – Preset #6, 11 – Network
	Bit 12	1 = PID Active (closed loop)
	Bit 13	1 = Torque mode active
	Bit 14	1 = Current limit
	Bit 15	1 = DC Braking
Word 1	Unsigned actual frequency 0.1Hz resolution.	
Word 2	Actual PID setpoint; Signed value -999 … 31000	
Word 3	Actual PID feedback; Signed value -999 … 31000	

5.7.5 Input Assembly 105 - Speed (Hz) & Actual Torque and Analog Input

Word 0	Bit 0	1 = Faulted
	Bit 1	Reserved
	Bit 2	1 = Running Forward
	Bit 3	1= Running Reverse
	Bit 4	1 = Ready
	Bit 5	0 = Local Control 1 = Control from Network
	Bit 6	0 = Local reference 1 = Reference from Network
	Bit 7	1 = At reference
	Bit 8 Bit 9 Bit 10 Bit 11	Actual set point source: 0 – keypad; 3 – Preset #1; 6 – Preset #4; 9 – Preset #7 1 – 0-10VDC; 4 – Preset #2; 7 – Preset #5; 10 – MOP 2 – 4-20mA; 5 – Preset #3; 8 – Preset #6; 11 – Network
	Bit 12	1 = PID Active (closed loop)
	Bit 13	1 = Torque mode active
	Bit 14	1 = Current limit
	Bit 15	1 = DC Braking
Word 1	Unsigned actual frequency 0.1Hz resolution.	
Word 2	Actual Torque [%]	
Word 3	Analog Input 0-10V TB [0.01VDC] • received value = 0x024B = 5.87[VDC]	

5.7.6 Input Assembly 106 - Custom Selectable

Word 0	Data from parameter/Id specified in parameter P450 For example: Setting the P450 to 508 will place the value of parameter P508 Motor Current into the Word0 of Input Assembly 106
Word 1	Data from parameter/Id specified in parameter P451 For example: Setting the P541 to 527 will place the value of parameter P527 Actual Frequency into the Word1 of Input Assembly 106
Word 2	Data from parameter/Id specified in parameter P452 For example: Setting the P452 to 520 will place the value of parameter P520 0-10VDC analog Input into the Word2 of Input Assembly 106
Word 3	Data from parameter/Id specified in parameter P453 For example: Setting the P453 to 506 will place the value of parameter P506 Motor Voltage into the Word3 of Input Assembly 106

NOTE

Last value not equal to zero in parameters P450 to P453 defines the end of Assembly 106.
For example: P450 = 0; P451=504; P452=104; P453=0. Last value not equal zero is in parameter P452. That defines input assembly 106 as a 3 words (6bytes) long with WORD 0 (P450 = 0) fixed at zero.

NOTE 1: Digital Input/Output State

Word – Digital Input/Output State	Bit 0	
	Bit 1	
	Bit 2	Output Fault
	Bit 3	Fast Current Limit State
	Bit 4	TB1 ON
	Bit 5	
	Bit 6	TB13A
	Bit 7	TB13B
	Bit 8	TB13C
	Bit 9	TB14 Out State
	Bit 10	Relay State
	Bit 11	Charge Relay
	Bit 12	Assertion level
	Bit 13	
	Bit 14	
	Bit 15	

Input Assembly 106 Options

In addition to all drive parameters that can be specified in Parameters P450 ... P453, there are additional status and real-time values (range 1-12) that can be specified.

- P45x = 1, SMV Status Word
- P45x = 2, Actual Frequency
- P45x = 3, Lenze C150 Status Word
- P45x = 4, Actual Speed in RPMs
- P45x = 5, Auxiliary Status
- P45x = 6, Drive RUN Status
- P45x = 7, Drive Fault Status
- P45x = 8, Digital I/O Status
- P45x = 9, Analog 0-10V Input
- P45x = 10, Analog 4-20mA Input
- P45x = 11, Actual PID Setpoint
- P45x = 12, Actual PID Feedback

5.7.6.1 P45x = 1, SMV Status Word

The SMV Status Word consists of 16 control bits some of which are reserved.

Table 12: SMV Status Word

b15	b14	b13	b12	b11	b10	b9	b8
DC Braking Status	Current Limit Status	Operating Mode	PID Mode Status	Actual Setpoint Reference Source			
b7	**b6**	**b5**	**b4**	**b3**	**b2**	**b1**	**b0**
At Setpoint Speed	Setpoint Status	Network Control Status	Drive Ready	Running Reverse	Running Forward	Reserved	Drive Faulted

Table 13: SMV Status Word BIT Functions

BIT	Function	Description
0	Drive Faulted	0 = No Fault 1 = Drive Faulted
1	Reserved	
2	Running Forward	1 = Indicates that the drive is running in the FORWARD direction
3	Running Reverse	1 = Indicates that the drive is running in the REVERSE direction
4	Drive Ready	1 = Drive ready
5	Network Control Status	0 = Local Control 1 = Network Control
6	Setpoint Status	0 = Local Speed Reference 1 = Network Speed Reference
7	At Setpoint Speed	0 = Actual output frequency <> Setpoint value 1 = Actual output frequency = Setpoint value
8	Actual Setpoint Reference Source	0 = Keypad, 4 = Preset #2, 8 = Preset #6
9		1 = 0-10VDC, 5 = Preset #3, 9 = Preset #7
10		2 = 4-20mA, 6 = Preset #4, 10 = MOP
11		3 = Preset #1, 7 = Preset #5, 11 = Network
12	PID Mode Status	0 = PID off - open loop 1 = PID on - closed loop
13	Operating Mode	0 = Drive is in Speed control mode 1 = Drive is in Torque control mode
14	Current Limit Status	1 = Current limit reached
15	DC Braking Status	0 = DC injection braking is OFF 1 = DC injection braking is active (ON)

5.7.6.2 P45x = 2, Actual Frequency

Unsigned actual frequency in Hz with 0.1Hz resolution.

5.7.6.3 P45x = 3, Lenze C150 Status Word

The Lenze C150 Status Word consists of 16 control bits some of which are reserved.

Table 14: Lenze C150 Status Word

b15	b14	b13	b12	b11	b10	b9	b8
Drive Healthy	Direction of Rotation	Over Voltage	Over Temp Warning	Controller Status			
b7	**b6**	**b5**	**b4**	**b3**	**b2**	**b1**	**b0**
Controller Inhibit	At Zero Speed	Above Speed	At Setpoint Speed	Reserved	Current Limit Status	Pulse Inhibit	Reserved

Table 15: Lenze C150 Status Word BIT Functions

BIT	Function	Description
0	Reserved	
1	Pulse Inhibit	0 = Pulse outputs enabled 1 = Pulse outputs inhibited
2	Current Limit Status	0 = Current limit not reached 1 = Current limit reached
3	Reserved	
4	At Setpoint Speed	0 = Actual output frequency <> Setpoint value 1 = Actual output frequency = Setpoint value
5	Above Speed	0 = Actual output frequency <= P136 value 1 = Actual output frequency > P136 value
6	At Zero Speed	0 = Actual output frequency <> 0 Hz 1 = Actual output frequency = 0 Hz
7	Controller Inhibit	0 = Controller Enabled 1 = Controller Inhibited
8	Controller Status	0 = No Fault 8 = Fault Present
9		
10		
11		
12	Over Temp Warning	0 = No over-temperature fault 1 = Over-temperature fault
13	Over Voltage	0 = No DC bus over-voltage 1 = DC bus over-voltage
14	Direction of Rotation	0 = CW (FORWARD) 1 = CCW (REVERSE)
15	Drive Ready	0 = Not ready 1 = Ready (No Faults)

5.7.6.4 P45x = 4, Actual Speed in RPMs

Unsigned Actual Speed in RPMs. Range: 0 - 65535.

5.7.6.5 P45x = 5, Auxiliary Status

The Auxiliary Status Word consists of 16 control bits some of which are reserved.

Table 16: Auxiliary Status Word

b15	b14	b13	b12	b11	b10	b9	b8
DC Braking Status	Network Control	Control Mode		Actual Network Setpoint Reference			
b7	**b6**	**b5**	**b4**	**b3**	**b2**	**b1**	**b0**
Drive Status Mode	PID Mode Status	Operating Mode	Setpoint Status	Actual Direction	Cmd Direction	Quick Stop Status	Run Status

Table 17: Auxiliary Status Word BIT Functions

BIT	Function	Description
0	Run Status	0 = Drive is Stop mode 1 = Drive is Run mode
1	Quick Stop Status	0 = Quick Stop is Not Active 1 = Quick Stop is Active
2	Cmd Direction	0 = Commanded direction is FORWARD 1 = Commanded direction is REVERSE
3	Actual Direction	0 = Actual direction is FORWARD 1 = Actual direction is REVERSE
4	Setpoint Status	0 = Setpoint source is local 1 = Setpoint source control is from network
5	Operating Mode	0 = Drive in Speed control mode 1 = Drive in Torque control mode
6	PID Mode Status	0 = PID off - open loop 1 = PID on - closed loop
7	Drive Status Mode	0 = Manual Mode 1 = Auto Mode
8 9 10 11	Actual Network Setpoint Reference Source	0 = Keypad, 1 = 0-10VDC, 2 = 4-20mA, 3 = Preset #1, 4 = Preset #2, 5 = Preset #3, 6 = Preset #4, 7 = Preset #5, 8 = Preset #6, 9 = Preset #7, 10 = MOP, 11 = Network
12 13	Control Mode	0 = Keypad 1 = Terminal 2 = Remote Keypad 3 = Network
14	Network Control Status	0 = Disabled 1 = Enabled
15	DC Braking Status	0 = DC injection braking is OFF 1 = DC injection braking is active (ON)

5.7.6.6 P45x = 6, Drive RUN Status

The Drive RUN status indicates the run status the drive is currently in.

Table 18: Drive RUN Status

RUN Status Value	Description
0	Drive Faulted, attempted restart & locked; Requires manual reset
1	Drive Faulted; Check P500 Fault History and correct fault condition
2	Drive has tripped into a fault and will automatically restart
3	Identification not complete
4	Forced Coast Stop
5	Drive is Stopped
6	Drive is Preparing to Run
7	Drive is in Identification State
8	Drive is in Run State
9	Drive is Accelerating
10	Drive is Decelerating
11	Drive stopped decelerating to avoid tripping HF fault, due to excessive motor regen (2 s max)
12	DC Injection brake activated
13	Flying Restart Attempt after Fault
14	Current Limit Reached
15	Fast Current Limit Overload
16	Drive is in Sleep Mode

5.7.6.7 P45x = 7, Drive Fault Status

The Drive Fault Status indicates the drive's present fault condition.

Table 19: Drive Fault Status

Fault Codes		
Fault Number	**Display**	**Fault Description**
0		NO FAULT
1	F.AF	Temperature Output Fault
2	F.OF	Over Current Fault
3	F.OF1	Ground (Short to Earth) Fault
4	F.AF	Excess Drive Temperature Fault
5	F.rF	Fly Start Fault
6	F.hF	High Bus Voltage (Over Voltage) Fault
7	F.LF	Low Bus Voltage (Under Voltage) Fault
8	F.PF	Motor Overload Fault
9	F.JF	OEM Defaults Corrupted Fault
10	F.IL	Illegal Setup Fault
11	F.dbF	Dynamic Brake Overheated Fault
12	F.SF	Single Phase Voltage Ripple to High Fault
13	F.EF	External Fault
14	F.CF	Control EEPROM Fault
15	F.UF	Start Power Loss Fault

Fault Codes		
Fault Number	**Display**	**Fault Description**
16	F.cF	Incompatibility Fault
17	F.F1	EEPROM Hardware Failure
18	F.F2	Edge Over Run; Soft Intr Re-entry
19	F.F3	PWM Over Run
20	F.F5	Stack Over Voltage Fault
21	F.F5	Stack Under Voltage Fault
22	F.F6	BGD Missing Fault
23	F.F7	Watchdog Timed Out Fault
24	F.F8	Illegal OPCO Fault
25	F.F9	Illegal Address Fault
26	F.bF	Drive Hardware Fault
27	F.F12	AD Offset Fault
28	F.JF	RKPD Lost Fault
29	F.AL	Assertion Level switched during Operation Fault
30	F.F4	FGD Missing Fault
31	F.F0	PW Missing Fault
32	F.FOL	Follower Loss
33	F.F11	Internal Communication from JK1 Lost Fault
34	F.ntF	Module Communication (SPI) Timeout Fault
35	F.fnr	FNR (Invalid Message Received)Fault
36	F.nF1	Network Fault #1
37	F.nF2	Network Fault #2
38	F.nF3	Network Fault #3
39	F.nF4	Network Fault #4
40	F.nF5	Network Fault #5
41	F.nF6	Network Fault #6
42	F.nF7	Network Fault #7
43	F.nF8	Network Fault #8
44	F.nF9	Network Fault #9
46 - 50		RESERVED

5.7.6.8 P45x = 8, Digital I/O Status

The Digital I/O Status Word consists of 16 control bits some of which are reserved.

Table 20: Digital I/O Status Word

b15	**b14**	**b13**	**b12**	**b11**	**b10**	**b9**	**b8**
Reserved	Reserved	Reserved	Reserved	Reserved	Relay Active	TB14 Output Active	TB13C Input Active
b7	**b6**	**b5**	**b4**	**b3**	**b2**	**b1**	**b0**
TB13B Input Active	TB13A Input Active	Reserved	TB1 Active	Reserved	Reserved	Reserved	Reserved

5.7.6.9 P45x = 9, Analog 0-10V Input

Analog Input: 0 - 10V in 0.1 VDC increments

Received Value = 0x3A = 5.8 VDC

5.7.6.10 P45x = 10, Analog 4-20mA Input

Analog Input: 4 - 20mA in 0.1 mA increments

Received Value = 0xA5 = 16.5 mA

5.7.6.11 P45x = 11, Actual PID Setpoint

Signed value: -999 to 31000

5.7.6.12 P45x = 12, Actual PID Feedback

Signed value: -999 to 31000

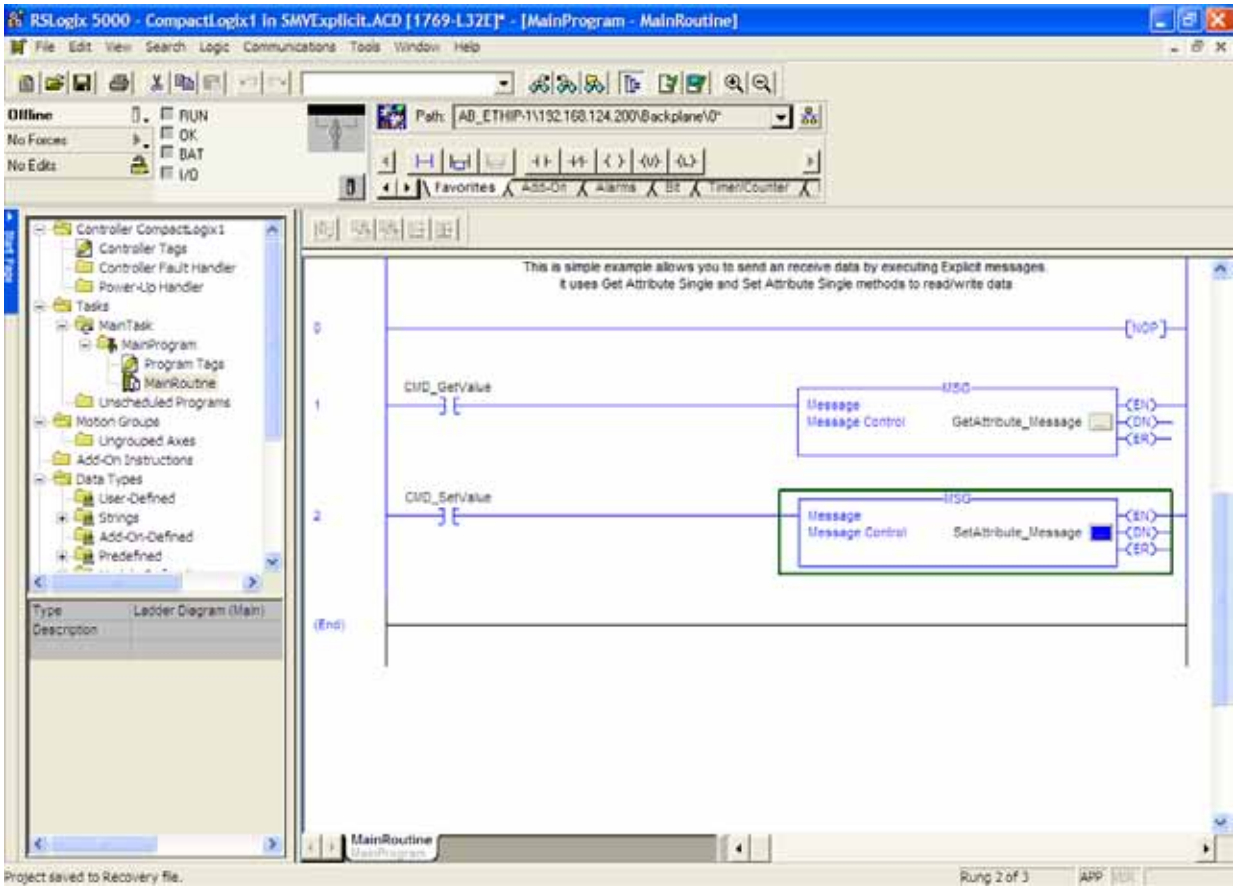
6 Acyclic Data Access

6.1 What is Acyclic Data?

- Acyclic / non-cyclic / Service access provides a method for the network master to access any drive or module parameter.
- This kind of parameter access is typically used for monitoring or low priority non-scheduled parameter access. However it can also be used to control the drive by writing assembly data.
- The SMV EtherNet/IP module supports several different methods of doing this.

6.2 Explicit Messaging

An explicit message is a logical instruction in the PLC's program used for messaging. It can be used to read/write to either a parameter setting or an assembly's data. In the case of CompactLogix, ControlLogix and SoftLogix the MSG instruction provides the capabilities described in this section. For other PLC types, consult that PLC's programming documentation.



To write a parameter value to the SMV using EtherNet/IP explicit messaging set the following:

Message Type = CIP Generic

Class = F (Hex)

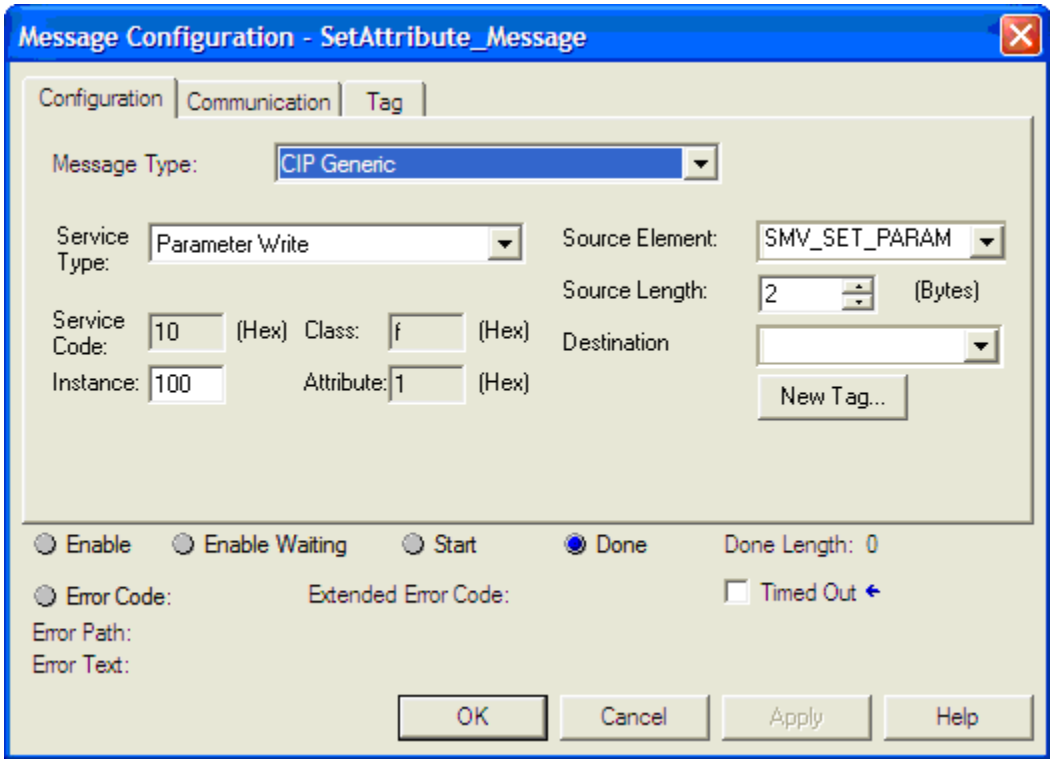
Attribute = 1

Service Code = 10 (Parameter Write)

Instance = the parameter number in the drive desired (i.e. P100 would be 100)

Source Element = the variable in the PLC used as the source of the data for a write

For a write of a parameter value set the source length = 2



To read a parameter value from the SMV using Ethernet IP explicit messaging set the following:

Message Type = CIP Generic

Class = F (Hex)

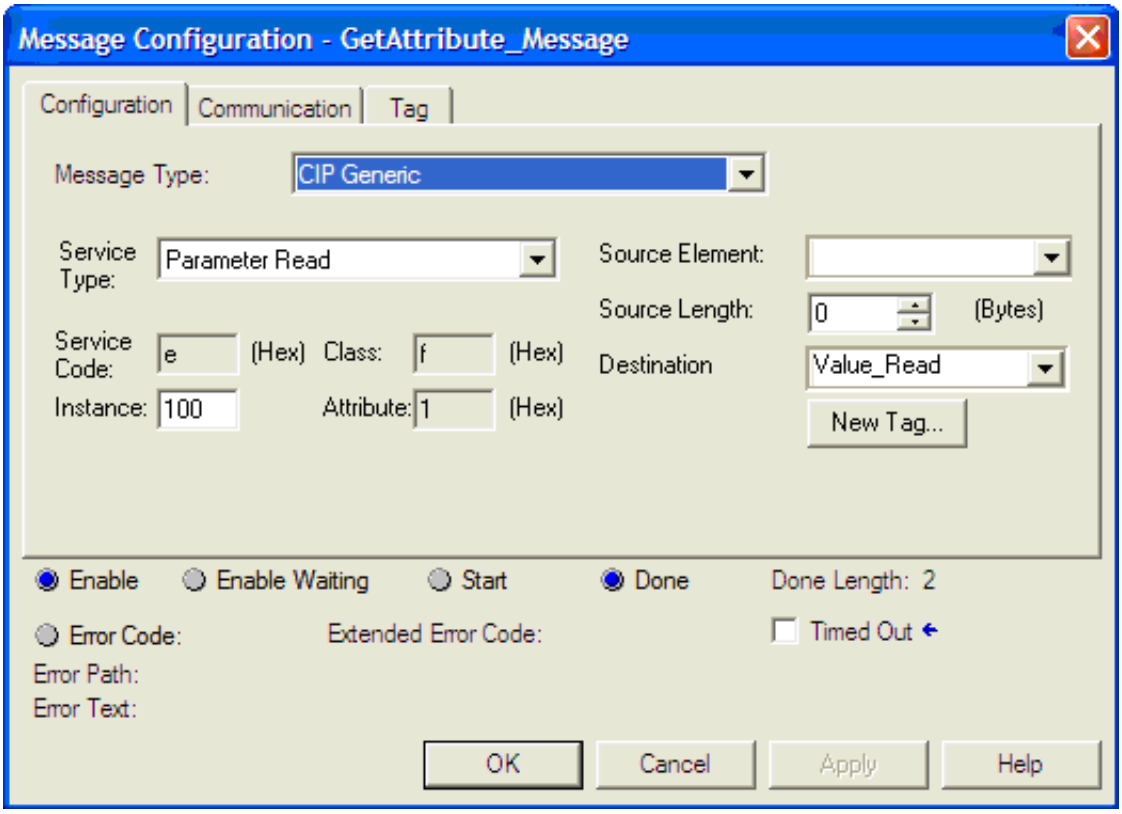
Attribute = 1

Service Code = e (Parameter Read)

Instance = the parameter number in the drive desired (i.e. P100 would be 100)

Destination = the target variable data from the drive will be copied to in the PLC

Make sure the tag used as the destination is a single word with INT format.



To write assembly data to the SMV using Ethernet IP explicit messaging set the following:

Message Type = CIP Generic

Class = 4 (Hex)

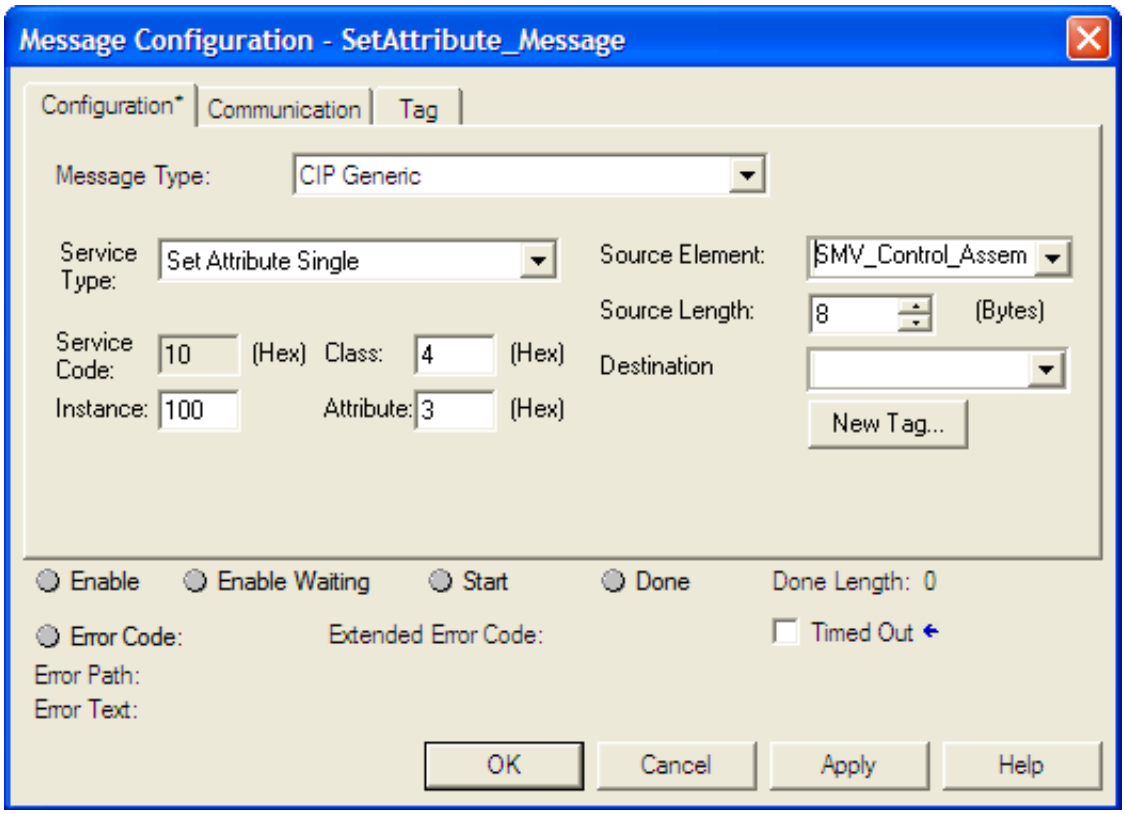
Attribute = 3

Service Code = 10 (Set Attribute Single)

Instance = the assembly number in the drive desired (i.e. Assembly 100 would be 100)

Source Element = variable in the PLC used as the source of the data for a write (must be in INT format)

When writing an Assembly, set the source length equal to the same number of bytes contained in the desired assembly (i.e., Assembly 100 contains 4 words which equals 8 bytes).



To read assembly data from the SMV using Ethernet IP explicit messaging set the following:

Message Type = CIP Generic

Class = 4 (Hex)

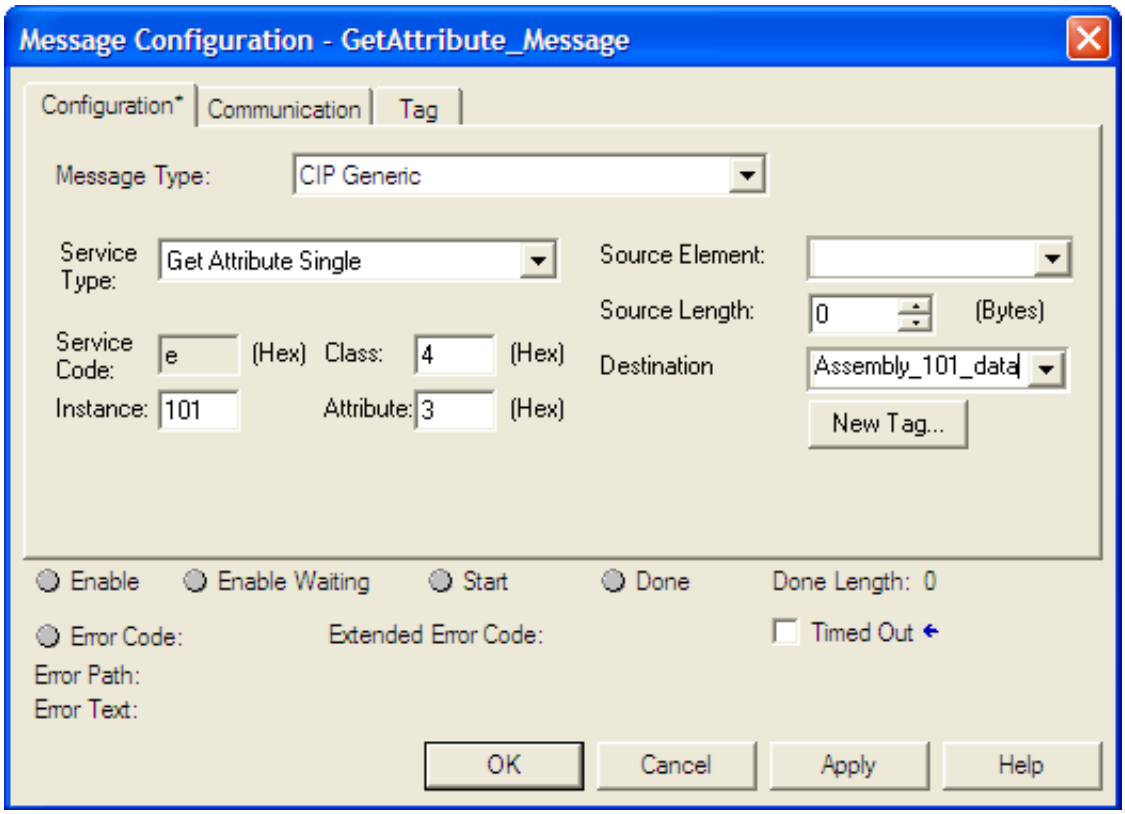
Attribute = 3

Service Code = e (Get Attribute Single)

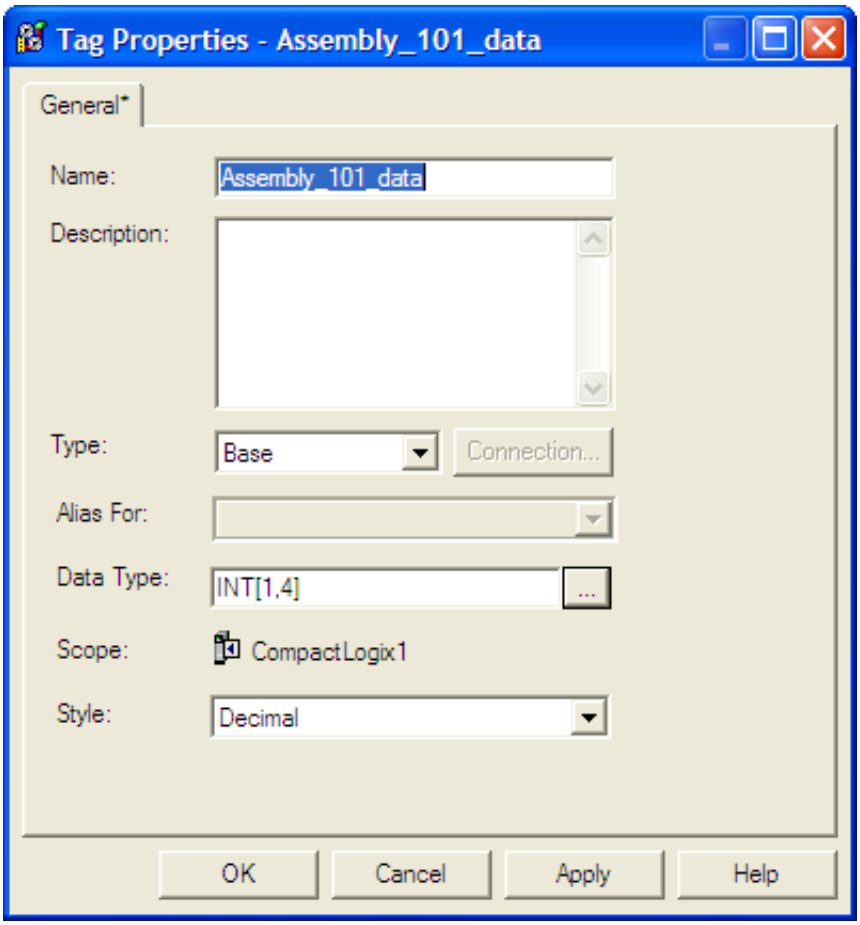
Instance = the assembly number in the drive desired (i.e. Assembly 100 would be 100)

Destination = the target variable data from the drive will be copied to in the PLC

Make sure the tag used as the destination is an array in INT format with the same length as the desired assembly.



When creating the tag for the data create an array of type INT. Dimension 0 MUST BE SET TO AS MANY WORDS ARE REQUIRED FOR THE PARTICULAR ASSEMBLY YOU ARE USING (i.e., 4 for Input Assembly 101). Dimension 1 should be set = 1.



Tag array creation for an assembly for explicit messaging.

To write to an assembly to the SMV using Ethernet IP explicit messaging set the following:

Message Type = CIP Generic

Class = 4 (Hex)

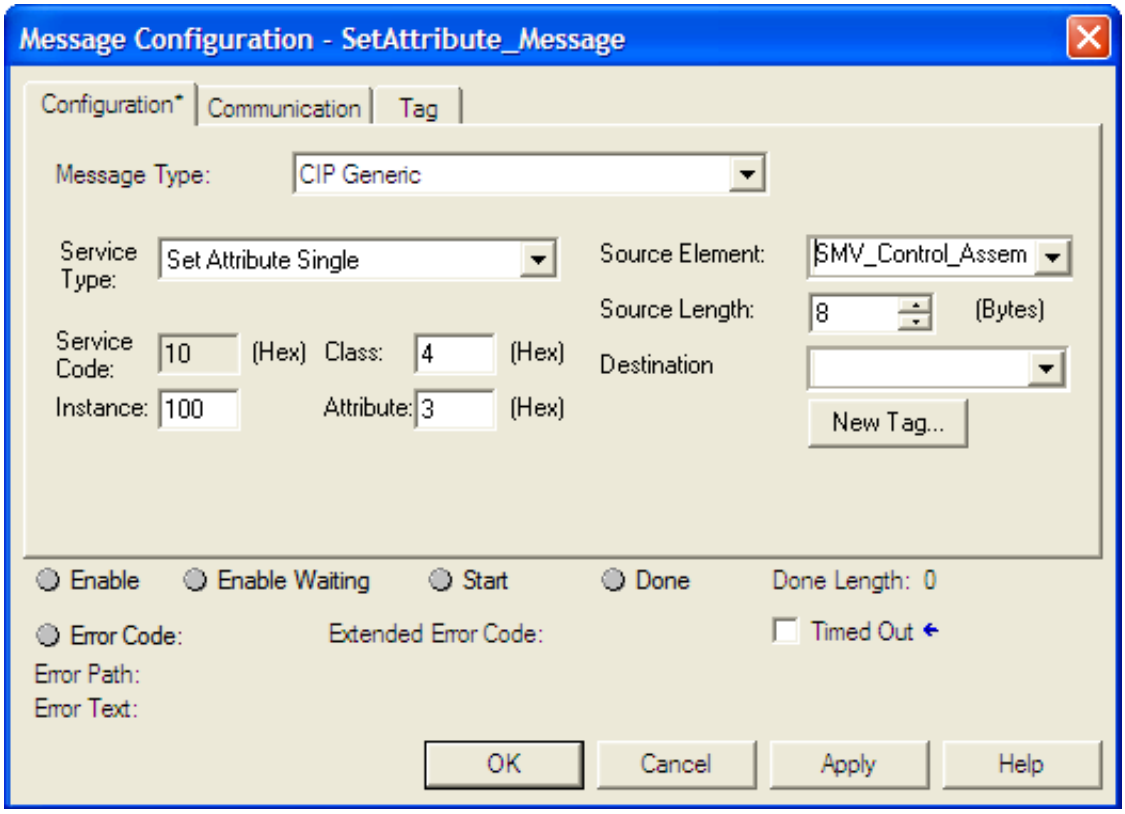
Attribute = 3

Service Code = 10 (Set Attribute Single)

Instance = the assembly number in the drive desired

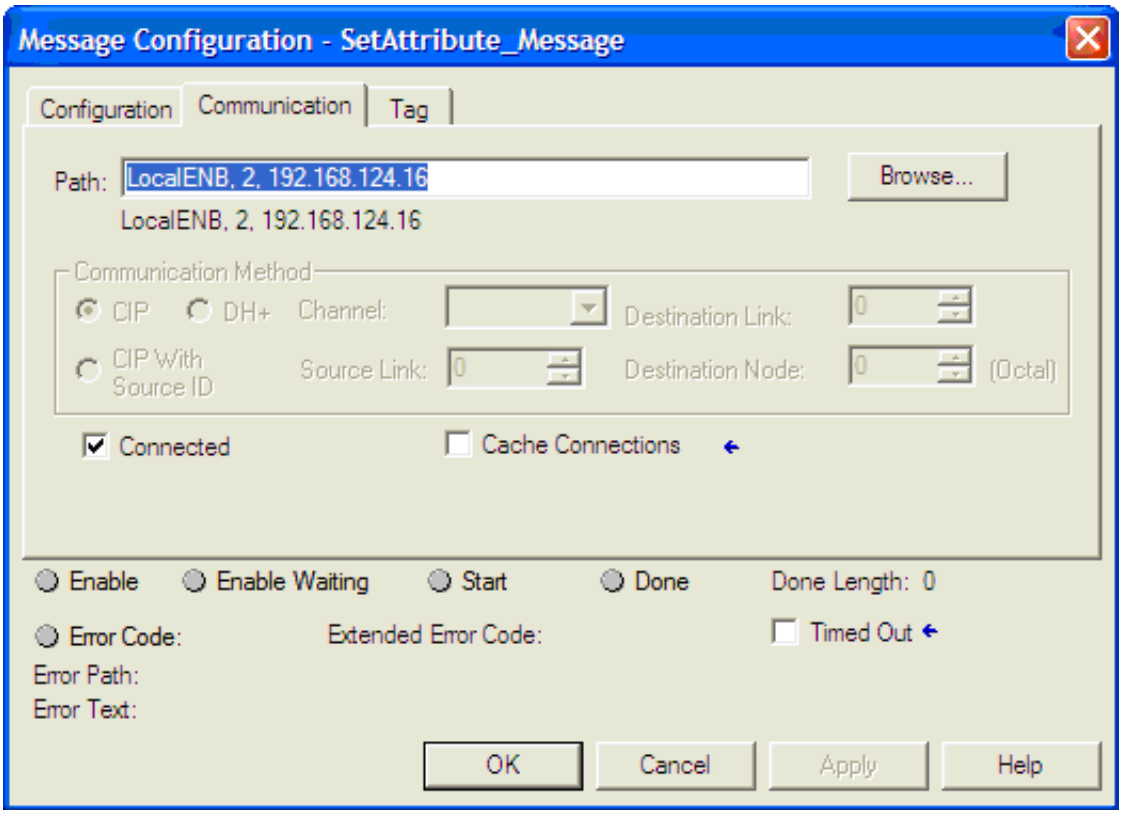
Source Element = the variable in the PLC used as the source of the data for a write

Make sure the tag used as the destination is an array INT format.



When creating the tag for the data create an array of type INT. Dimension 0 MUST BE SET TO AS MANY WORDS ARE REQUIRED FOR THE PARTICULAR ASSEMBLY YOU ARE USING (i.e., 4 for Input Assembly 100). Dimension 1 should be set = 1.

For any explicit message the path will need to be set to route the message out the controller's Ethernet port to the IP address of the Drive. This path will differ with the PLC used. Consult the PLC manufacturer for assistance with determining how to set this path if needed.



6.3 Explicit Messaging Timeout

It is often desirable to set a fault timeout condition to prevent the drive from operating in a runaway condition. To do this while controlling the drive via explicit messaging, set P431, P433 and P435 to 0. Set the timeout period desired (in milliseconds) in P435.

7 Advanced Features

7.1 Option Module Advanced Parameters

7.1.1 Module Revision

P401 - Module Revision			
Default:	5.x.x	Range:	5.0.0 - 5.9.9
Access:	RO	Type:	Integer

Display reads 5.x.x where: 5 = EtherNet/IP Module and x.x = Module Revision

7.1.2 Module Status

P402 - Module Status			
Default:	N/A	Range:	0 - 7
Access:	RO	Type:	Integer

Table 21: Module Status

P402 Value	Description	P402 Value	Description
0	Not Initialised	4	Error: Failed Initialisation
1	Initialisation: Module to EPM	5	Error: Time Out
2	Initialisation: EPM to Module	6	Error: Module Mismatch (P401)
3	Online	7	Error: Protocol Mismatch (P400)

7.1.4 Module Time-out Action

P404 - Module Time-out Action			
Default:	3	Range:	0 - 3
Access:	RW	Type:	Integer

This parameter controls the action to be taken in the event of a Module-to-Drive time out. The Time-out period is fixed at 200 ms.

Table 22: Module Time-out Action

P404 Value	0	1	2	3
Description	No Action	Stop (controlled by P111)	Quick Stop	Fault F.nEF

7.1.5 Initialize Ethernet/IP Settings

P408 - Initialize Ethernet/IP Settings			
Default:	0	Range:	0 - 1
Access:	RW	Type:	Integer

This parameter reinitializes the Ethernet/IP network parameters. 0 = No action. 1 = Reset communication.

7.1.6 Module Firmware

P494 - Module Firmware			
Default:	N/A	Range:	1.00 - 99.99
Access:	RO	Type:	Integer

Displays the module firmware revision in the format of xx.yy, where: xx = Major version and yy = Minor version

8 Diagnostics

8.1 Faults

In addition to the normal drive fault codes, the additional codes listed in Table 23 may be generated by the option module during a fault condition.

Table 23: Fault Codes

Fault Code	Definition	Remedy
F.ntF	Module Time-out	Module to drive communications time out. Check cable and connection between drive and option module.
F.nF1	NetIdleMode (Idle event received in I/O message header)	Refer to section 9.1, Parameter P431
F.nF2	NetFaultMode (Loss of I/O connection Exclusive Owner)	Refer to section 9.1, Parameter P432
F.nF3	Network Fault triggered via Control Supervisor Object 0x29-1-17	Refer to Section 9.2.8, Control Supervisor Object
F.nF4	Explicit message timeout reaction	Triggered by Explicit message expected packet rate time-out, 'F.nF4' Refer to section 9.1, Parameter P433
F.nF5	Action on overall Ethernet timeout (no explicit or I/O messages received or Web Server access)	Trigger by expiration of timer monitoring all messages received by the module (refer to P435 for setup) Refer to section 9.1, Parameter P434
F.nF6	Explicit message timeout reaction	Expiration of overall explicit message timer 'F.nF6'. Refer to section 9.1, Parameter P433
F.nF7	Overall I/O Message Timeout	Expiration of overall I/O message timer 'F.nF7'. Refer to section 9.1, Parameter P432

8.2 Troubleshooting

Table 24: Troubleshooting

Symptom	Possible Cause	Remedy
No communications from the option module	Module is not initialised	• Check the drive to module connection. • Check P400 and P402.
	Incorrect EtherNet/IP settings	• Check P410 - P421. • If unsure of setting, reset EtherNet/IP parameters to factory default using P403. • Power cycle drive after changing IP address setting or use P408.
	Improper wiring	• Check wiring between the EtherNet/IP network and communication module. • Ensure that the terminal block is properly seated. • Check connection between module and drive.
EtherNet/IP write commands are ignore or return exceptions	"Network enabled" terminal is either open or not configured	Configure one of the input terminals (P121, P122 or P123) to "Network Enabled" function (selection 9) and close the corresponding contact.
Drive does not change direction to REVERSE	Parameter P112 is set to 0 (Forward Only)	Set drive parameter P112 to 1 to enable Forward & Reverse direction

9 Reference

9.1 Parameter Reference

Table 25 lists the EtherNet/IP related parameters and settings for the SMVector Drive. The table includes parameter number, name, access rights, default value, settings and comments.

Table 25: SMV EtherNet/IP Communication Parameters

No	Name	Access	Default	Possible Settings	Comments
EtherNet/IP Module Specific Parameters					
400	Network Protocol	R/W	5	0 – Not Active 5 – Ethernet IP	
401	Module Revision	RO			Display reads 06.x.x where: 06 = Ethernet IP Module x.x = Module Revision
402	Module Status	RO	0	0 … 7	0 - Not Initialized 1 – Initialization: Module to EPM 2 – Initialization: EPM to Module 3 – Online 4 – Failed Initialization Error 5 – Time-out Error 6 – Initialization Failed (Module type mismatch P401) 7 – Initialization Error (Protocol selection mismatch P400)
403	Module Reset	R/W	0	0 – No Action 1 – Reset Module Parameters values to default	Returns module parameters 401…499 to the default values shown in the manual
404	Module Time-out action	R/W	0	0 – No Fault 1 – STOP (see P111) 2 – Quick Stop 3 – Fault (F_ntF)	Action to be taken in the event of a Module/Drive Time-out. Time is fixed at 200ms Selection 1 (STOP) is by the method selected in P111
405	Current Network Fault	RO		0 – No Fault 1 – F.nF1 2 – F.nF2 3 – F.nF3 4 – F.nF4 5 – F.nF5 6 – F.nF6 7 – F.nF7	0 – No Fault 1 – F.nF1 – NetIdle Mode 2 – F.nF2 – Loss of Ethernet I/O connection 3 – F.nF3 – Network Fault triggered via Control Supervisor Object 0x29-1-17 4 – F.nF4 – Explicit Message Timeout 5 – F.nF5 – Overall Network Timeout 6 – F.nF6 – Overall Explicit Timeout 7 – F.nF7 – Overall I/O Message Timeout
406	Proprietary	RO			Manufacturer specific
EtherNet/IP Configuration Parameters					
408	Initialize Ethernet/IP settings	R/W	0	0 – No action 1 – reset communication	Re-initialize Ethernet/IP
	IP Address	R/W			
410	Digit 1		192		Highest quarter
411	Digit 2		168		
412	Digit 3		124		
413	Digit 4		16		Lowest quarter
	Network Mask	R/W			
414	Digit 1		255		Highest quarter
415	Digit 2		255		
416	Digit 3		255		
417	Digit 4		0		Lowest quarter
	Gateway Address	R/W			
418	Digit 1		192		Highest quarter
419	Digit 2		168		
420	Digit 3		124		
421	Digit 4		1		Lowest quarter
	Multicast Address	R/W			
422	Digit 1		239		Highest quarter
423	Digit 2		64		
424	Digit 3		2		
425	Digit 4		224		Lowest quarter

No	Name	Access	Default	Possible Settings	Comments
426	TTL Value	R/W	1	1 minimum 255 maximum	Time-to-live value for IP multicast packets
427	Configuration Control	R/W	0	0 – stored 1 - DHCP	Source of configuration values
428	Duplex Control	R/W	1	0 – half duplex 1 – full duplex	
429	Interface Speed Control	R/W	1	0 – 10Mbps 1 - 100Mbps	
430	Interface Speed Actual	RO		100 – 100Mbps 10 - 10Mbps	
431	NetIdleMode (Idle event received in I/O message header)	R/W	0	0 – Network Fault 'F.nF1' 1 – Ignore Fault Condition 2 – Vendor specific (switch off network control and reference - no drive fault or stop!)	Mode on reception of CIP communication IDLE event *Only active in Drive Network Control (n.xxx)
432	NetFaultMode (Loss of I/O connection Exclusive Owner)	R/W	0	0 – Network Fault 'F.nF2' or 'F.nF7' 1 – Ignore Fault Condition 2 – Vendor specific (switch off network control and reference - no drive fault or stop!)	Action on loss of CIP network I/O - expected packet timeout. Timeout period = 4*Expected packet rate (Requested Packet Interval, RPI) or Expiration of overall I/O message timer 'F.nF7'. The timeout value for 'overall I/O message timer is set by P435. *Armed after at least 1 successful reception of I/O message. *Only active in Drive Network Control (n.xxx)
433	Explicit message timeout reaction	R/W	1	0 – Network Fault 'F.nF4' or 'F.nF6' 1 – Ignore Fault Condition 2 – Vendor specific (switch off network control and reference - no drive fault or stop!) 3 – Trigger drive STOP (type set by P111) 4 – Trigger inhibit the drive (Coast to Stop) 5 – Trigger Quick Stop	Triggered by Explicit message expected packet rate time-out, 'F.nF4' or Expiration of overall explicit message timer 'F.nF6'. The timeout value for 'overall explicit message timer' is set by P435. *Armed after at least 1 successful reception of explicit message. *Only active in Drive Network Control (n.xxx)
434	Action on overall Ethernet timeout (no explicit or I/O messages received or Web Server access)	R/W	1	0 – Network Fault 'F.nF5' 1 – Ignore Fault Condition 2 – Vendor specific (switch off network control and reference - no drive fault or stop!) 3 – Trigger drive STOP (type set by P111) 4 – Trigger inhibit the drive (Coast to Stop) 5 – Trigger Quick Stop	Trigger by expiration of timer monitoring all messages received by the module (P435 for setup) *Armed after at least 1 successful reception of any message addressed to this module.
435	Message timeout – monitoring time	R/W	2000	0 – 65535 [ms]	Parameter used to monitor all explicit and I/O messages received by the module
436	Network Status	RO		4 Digit	Power, Control and Network Status
	Digit 1: Power Status				
	Digit 2: Control Status	RO		0…3	0 – Local Control and reference 1 – Network Control, Local reference 2 – Local Control, Network reference 3 – Network Control, Network reference
	Digit 3: Network Status		0	0 – Network not connected 1 – Network connected	
	Digit 4: Reserved				
437	Frames Transmitted OK	RO	0		
438	Frames Received OK	RO	0		
439	Collision Count	RO	0		
440	Par. ID of word 0 Output	R/W	2	0…9	0 – Disabled / Not evaluated 1 – SMV Control Word 2 – Network Command Frequency 3 – Lenze C135 Control Word 4 – Network Speed in unsigned RPM 5 – Network PID Setpoint 6 – Network Torque Setpoint 7 – Network Speed in signed RPM (control direction) 8 – Digital Outputs 9 – Analog Output
441	Par. ID of word 1 Output	R/W	0	0…9	
442	Par. ID of word 2 Output	R/W	0	0…9	
443	Par. ID of word 3 Output	R/W	0	0…9	
448	Last Accessed Output Assembly	RO	1	20, 21, 100 etc.	
449	Output Assembly Access Counter	RO	1	0…9999	Overflow above 9999 to 0
450	Par. ID of word 0 - Input	R/W	1	0…550	
451	Par. ID of word 1 – Input	R/W	2	0…550	
452	Par. ID of word 2 – Input	R/W	0	0…550	
453	Par. ID of word 3 - Input	R/W	0	0…550	
458	Last Accessed Input Assembly	RO	1	70, 71, 101 etc	
459	Input Assembly Access Counter	RO	1	0…9999	Overflow above 9999 to 0

No	Name	Access	Default	Possible Settings	Comments
Connection1					
460	Display Digit 1 (hex) (low nibble)	RO	0	0 – Nonexistent 3 – Established 4 – Timed out	State
	Display Digit 2 (hex) (high nibble)	RO	0	0 – nonexistent 1 – Exclusive Owner 2 – Input Only 3 – Listen Only 4 – Explicit Connection	Type
461	Trigger	RO		0x01 – Class 1 cyclic client 0xA3 – Class 3 application object server (Explicit Connection)	Bits 0, 1, 2, 3 – transport class 0 – Class 0 1 – Class 1 2 – Class 2 3 – Class 3 Bits 4, 5, 6 – production trigger 0 – Cyclic 1 – Change of state 2 – Application Object (use as polled conn) Bit 7 – direction 0 – Client 1 – Server
462	Expected Packet Rate	RO	0	0…65535 (ms)	
463	Transmission Counter	RO	0		Overflow over 255
464	Reception Counter	RO	0		Overflow over 255
Connection2					
465	Display Digit 1 (hex) (low nibble)	RO	0	0 – Nonexistent 3 – Established 4 – Timed out	State
	Display Digit 2 (hex) (high nibble)	RO	0	0 – nonexistent 1 – Exclusive Owner 2 – Input Only 3 – Listen Only 4 – Explicit Connection	Type
466	Trigger	RO		0x01 – Class 1 cyclic client 0xA3 – Class 3 application object server (Explicit Connection)	Bits 0, 1, 2, 3 – transport class 0 – Class 0 1 – Class 1 2 – Class 2 3 – Class 3 Bits 4, 5, 6 – production trigger 0 – Cyclic 1 – Change of state 2 – Application Object (use as polled conn) Bit 7 – direction 0 – Client 1 – Server
467	Expected Packet Rate	RO	0	0…65535 (ms)	
468	Transmission Counter	RO	0		Overflow over 255
469	Reception Counter	RO	0		Overflow over 255
Connection3					
470	Display Digit 1 (hex) (low nibble)	RO	0	0 – Nonexistent 3 – Established 4 – Timed out	State
	Display Digit 2 (hex) (high nibble)	RO	0	0 – nonexistent 1 – Exclusive Owner 2 – Input Only 3 – Listen Only 4 – Explicit Connection	Type
471	Trigger	RO		0x01 – Class 1 cyclic client 0xA3 – Class 3 application object server (Explicit Connection)	Bits 0, 1, 2, 3 – transport class 0 – Class 0 1 – Class 1 2 – Class 2 3 – Class 3 Bits 4, 5, 6 – production trigger 0 – Cyclic 1 – Change of state 2 – Application Object (use as polled conn) Bit 7 – direction 0 – Client 1 – Server
472	Expected Packet Rate	RO	0	0…65535 (ms)	
473	Transmission Counter	RO	0		Overflow over 255
474	Reception Counter	RO	0		Overflow over 255

No	Name	Access	Default	Possible Settings	Comments
Connection4					
475	Display Digit 1 (hex) (low nibble)	RO	0	0 – Nonexistent 3 – Established 4 – Timed out	State
	Display Digit 2 (hex) (high nibble)	RO	0	0 – nonexistent 1 – Exclusive Owner 2 – Input Only 3 – Listen Only 4 – Explicit Connection	Type
476	Trigger	RO		0x01 – Class 1 cyclic client 0xA3 – Class 3 application object server (Explicit Connection)	Bits 0, 1, 2, 3 – transport class 0 – Class 0 1 – Class 1 2 – Class 2 3 – Class 3 Bits 4, 5, 6 – production trigger 0 – Cyclic 1 – Change of state 2 – Application Object (use as polled conn) Bit 7 – direction 0 – Client 1 – Server
477	Expected Packet Rate	RO	0	0…65535 (ms)	
478	Transmission Counter	RO	0		Overflow over 255
479	Reception Counter	RO	0		Overflow over 255
Connection5					
480	Display Digit 1 (hex) (low nibble)	RO	0	0 – Nonexistent 3 – Established 4 – Timed out	State
	Display Digit 2 (hex) (high nibble)	RO	0	0 – nonexistent 1 – Exclusive Owner 2 – Input Only 3 – Listen Only 4 – Explicit Connection	Type
481	Trigger	RO		0x01 – Class 1 cyclic client 0xA3 – Class 3 application object server (Explicit Connection)	Bits 0, 1, 2, 3 – transport class 0 – Class 0 1 – Class 1 2 – Class 2 3 – Class 3 Bits 4, 5, 6 – production trigger 0 – Cyclic 1 – Change of state 2 – Application Object (use as polled conn) Bit 7 – direction 0 – Client 1 – Server
482	Expected Packet Rate	RO	0	0…65535 (ms)	
483	Transmission Counter	RO	0		Overflow over 255
484	Reception Counter	RO	0		Overflow over 255
Connection6					
485	Display Digit 1 (hex) (low nibble)	RO	0	0 – Nonexistent 3 – Established 4 – Timed out	State
	Display Digit 2 (hex) (high nibble)	RO	0	0 – nonexistent 1 – Exclusive Owner 2 – Input Only 3 – Listen Only 4 – Explicit Connection	Type
486	Trigger	RO		0x01 – Class 1 cyclic client 0xA3 – Class 3 application object server (Explicit Connection)	Bits 0, 1, 2, 3 – transport class 0 – Class 0 1 – Class 1 2 – Class 2 3 – Class 3 Bits 4, 5, 6 – production trigger 0 – Cyclic 1 – Change of state 2 – Application Object (use as polled conn) Bit 7 – direction 0 – Client 1 – Server
487	Expected Packet Rate	RO	0	0…65535 (ms)	
488	Transmission Counter	RO	0		Overflow over 255
489	Reception Counter	RO	0		Overflow over 255

No	Name	Access	Default	Possible Settings	Comments
490	Motor Type	R/W	7	0…7	
492	Write Access Disabled via Web Server	R/W	0	0, 1	0 – Write Access Enabled 1 – Write Access Disabled
Module Specific Parameters					
494	Communication Module Software Version	RO			Format: x.yz
495	Internal Code	RO			Alternating Display: xxx-; -yy
498	Missed Messages: Drive to Module	RO			
499	Missed Messages: Module to Drive	RO			

9.2 Object Specifications

9.2.1 Identity Object - Class 0x01 (1 dec)

IDENTITY CLASS ATTRIBUTES				
ATTRIBUTE ID	ACCESS RULE	NAME	DATA TYPE	VALUE
INSTANCE 0				
1	GET	REVISION	UINT	1
INSTANCE 1				
1	GET	VENDOR ID	UINT	587
2	GET	DEVICE TYPE	UINT	2 (AC drive)
3	GET	PRODUCT CODE	UINT	_ (SMV EtherNet/IP Module)
4	GET	MAJOR REV.	USINT	1
		MINOR REV.	USINT	1
5	GET	STATUS	USINT	0 = Net Configured 4 = Configured 5 = Owned
6	GET	SERIAL NUMBER	UDINT	Unique 32-bit number
7	GET	PRODUCT NAME	ASCII String	“AC Technology Corp, SMV AC Drive”

IDENTITY CLASS SERVICES			
SERVICE CODE	IMPLEMENTED FOR		SERVICE NAME
	CLASS	INSTANCE	
0x0E	YES	YES	Get_Attribute_Single
0x05	NO	YES	RESET

9.2.2 Message Router Object - Class 0x02 (2 dec)

MESSAGE ROUTER CLASS ATTRIBUTES				
ATTRIBUTE ID	ACCESS RULE	NAME	DATA TYPE	VALUE
INSTANCE 0				
1	GET	REVISION	UINT	1
INSTANCE 1				
1	GET	CLASS LIST	ARRAY	List of Implemented Classes
2	GET	MAXIMUM NUMBER OF CONNECTIONS	UINT	1
3	GET	CURRENTLY USED CONNECTIONS	UINT	1
4	GET	CURRENTLY USED ID’s	Array of UINT	List of Connection ID

MESSAGE ROUTER CLASS SERVICES			
SERVICE CODE	IMPLEMENTED FOR		SERVICE NAME
	CLASS	INSTANCE	
0x0E	YES	YES	Get_Attribute_Single

9.2.3 Assembly Object - Class 0x04 (4 dec)

ASSEMBLY CLASS ATTRIBUTES				
ATTRIBUTE ID	**ACCESS RULE**	**NAME**	**DATA TYPE**	**VALUE**
INSTANCE 0				
1	GET	REVISION	UINT	2
2	GET	MAXIMUM NUMBER OF INSTANCES	USINT	107
INSTANCES (See Below)				
1	GET	NUMBER OF MEMBER	USINT	1
3	GET/SET	DATA	INSTANCE	

INSTANCE NUMBER AND NAME	ACCESS RULE FOR ATTRIBUTE #3 DATA
INSTANCE 20 = BASIC SPEED CONTROL	GET / SET
INSTANCE 21 = EXTENDED SPEED CONTROL	GET / SET
INSTANCE 100 = EXTENDED SPEED HZ + DIGITAL AND ANALOG OUTPUT	GET / SET
INSTANCE 102 = PID SETPOINT + DIGITAL AND ANALOG OUTPUT	GET / SET
INSTANCE 104 = TORQUE SETPOINT + DIGITAL AND ANALOG OUTPUT	GET / SET
INSTANCE 107 = CUSTOM: SELECTABLE WITH PARAMETERS P440 - P443	GET / SET
INSTANCE 70 = BASIC SPEED CONTROL	GET
INSTANCE 71 = EXTENDED SPEED CONTROL	GET
INSTANCE 101 = EXTENDED SPEED HZ + ANALOG AND DIGITAL I/O	GET
INSTANCE 103 = CUSTOM: SPEED, PID SETPOINT, FEEDBACK	GET
INSTANCE 105 = CUSTOM: SPEED, ACTUAL TORQUE, ANALOG INPUT	GET
INSTANCE 106 = CUSTOM: DATA WORDS SELECTABLE WITH PARAMETERS P450 - P453	GET

ASSEMBLY CLASS SERVICES			
SERVICE CODE	IMPLEMETED FOR		SERVICE NAME
	CLASS	INSTANCE	
0x0E	YES	YES	Get_Attribute_Single

9.2.4 Connection Manager Object - Class 0x06 (6 dec)

CONNECTION MANAGER INSTANCE ATTRIBUTES				
ATTRIBUTE ID	**ACCESS RULE**	**NAME**	**DATA TYPE**	**VALUE**
INSTANCE 0				
1	SET	OPEN REQUESTS	UINT	
2	SET	OPEN FORMAT REQUESTS	UINT	
3	SET	OPEN RESOURCE REJECTS	UINT	
4	SET	OPEN OTHER REJECTS	UINT	
5	SET	CLOSE REQUESTS	UINT	
6	SET	CLOSE FORMAT REQUESTS	UINT	
7	SET	CLOSE OTHER REQUESTS	UINT	
8	SET	CONNECTION TIMEOUTS	UINT	
9	GET	CONNECTION ENTRY LIST	STRUCT of:	
		NUM COMM ENTRIES	UINT	# of bits in ConnOpenBits attribute
		COMM OPEN BITS	ARRAY OF BOOL	0 = Connection Instance Non-Existent 1 = Connection Instance Exists. Query for more information
10		RESERVED		
11	GET	CPU_UTILIZATION	UINT	0 - 1000 (0-100%)
12	GET	MAX BUFF SIZE	UDINT	size in Bytes
13	GET	BUFF SIZE REMAINING	UDINT	size in Bytes

CONNECTION MANAGER CLASS SERVICES			
SERVICE CODE	IMPLEMENTED FOR		SERVICE NAME
	CLASS	INSTANCE	
01hex	YES		Get_Attributes_All
0Ehex		YES	Get_Attribute_Single
10hex		YES	Set_Attribute_Single

9.2.5 Parameter Object - Class 0x0F (15 dec)

PARAMETER CLASS ATTRIBUTES - NUMBER OF INSTANCES (PARAMETERS): 550				
ATTRIBUTE ID	**ACCESS RULE**	**NAME**	**DATA TYPE**	**VALUE**
INSTANCE 0				
1	GET	REVISION	UINT	2
2	GET	NUMBER OF INSTANCES	UINT	550
8	GET	PARAMETER CLASS	WORD	0x03
		DESCRIPTOR		
9	GET	CONFIGURATION	UINT	0
		ASSEMBLY #		
10	GET	NATIVE LANGUAGE	UINT	0 = English
INSTANCE 1 - 550				
1	GET / SET	PARAMETER VALUE		
2	GET	LINK PATH SIZE	USINT	0 to 2
3	GET	LINK PATH	DNET PATH	
4	GET	DESCRIPTOR	WORD	
5	GET	DATA TYPE	USINT	
6	GET	DATA SIZE	USINT	

PARAMETER CLASS SERVICES			
SERVICE CODE	IMPLEMENTED FOR		SERVICE NAME
	CLASS	INSTANCE	
0x0E	YES	YES	Get_Attribute_Single
0x10	NO	YES	Set_Attribute_Single

9.2.6 Parameter Group Object - Class 0x10 (16 dec)

PARAMETER GROUP CLASS ATTRIBUTES				
ATTRIBUTE ID	**ACCESS RULE**	**NAME**	**DATA TYPE**	**VALUE**
INSTANCE 0				
1	GET	REVISION	UINT	1
2	GET	NUMBER OF INSTANCES	UINT	8
8	GET	NATIVE LANGUAGE	UINT	0 = English
INSTANCE 1 - 8				
1	GET	GROUP NAME	SHORT STRING	
2	GET	NUMBER OF MEMBERS IN THE GROUP	UINT	
3	GET	1st PARAMETER IN THE GROUP	UINT	
4	GET	2nd PARAMETER IN THE GROUP	UINT	
n	GET	(n-2) th PARAMETER IN THE GROUP	UINT	

9.2.7 Motor Data Object - Class 0x28 (40 dec)

MOTOR GROUP CLASS ATTRIBUTES				
ATTRIBUTE ID	**ACCESS RULE**	**NAME**	**DATA TYPE**	**VALUE**
INSTANCE 0				
1	GET	REVISION	UINT	1
2	GET	NUMBER OF INSTANCES	UINT	1
INSTANCE 1				
1	GET	NUMBER OF SUPPORTED ATTRIBUTES	USINT	7
2	GET	ATTRIBUTE LIST	ARRAY	
3	GET/SET	MOTOR TYPE	USINT	0 - 10
6	GET/SET	RATED CURRENT	UINT	RATED STATOR CURRENT (0.1A)
7	GET/SET	RATED VOLTAGE	UINT	RATED BASE VOLTAGE (V)
9	GET/SET	RATED FREQUENCY	UNIT	RATED FREQUENCY (Hz)
11	GET/SET	NOMINAL SPEED AT RATED FREQUENCY	UNIT	NOMINAL SPEED (RPM)

MOTOR DATA CLASS SERVICES			
SERVICE CODE	**IMPLEMENTED FOR**		**SERVICE NAME**
	CLASS	**INSTANCE**	
0x0E	YES	YES	GET_ATTRIBUTE_SINGLE
0x10	NO	YES	SET_ATTRIBUTE_SINGLE

9.2.8 Control Supervisor Object - Class 0x29 (41 dec)

CONTROL CLASS ATTRIBUTES				
ATTRIBUTE ID	**ACCESS RULE**	**NAME**	**DATA TYPE**	**VALUE**
INSTANCE 0				
1	GET	REVISION	UINT	1
2	GET	NUMBER OF INSTANCES	UINT	1
INSTANCE 1				
1	GET	NUMBER OF SUPPORTED ATTRIBUTES	USINT	16
2	GET	ATTRIBUTE LIST	ARRAY	
3	GET/SET	RUNFWD	BOOL	0 to 1
4	GET/SET	RUNREV	BOOL	0 to 1
5	GET/SET	NETCTRL	BOOL	0 to 1
6	GET	STATE	UNIT	3 = READY 4 = ENABLED 5 = FAULTED
7	GET	RUNNINGFWD	BOOL	0 to 1
8	GET	RUNNINGREV	BOOL	0 to 1
9	GET	READY	BOOL	0 to 1
10	GET	FAULTED	BOOL	0 to 1
11	GET	WARNING	UNIT	0 (Not Supported)
12	GET/SET	FAULTRST	BOOL	0 to 1
13	GET	FAULT CODE	UNIT	0 to 65535
15	GET	CTRLFROMNET	US INT	0 to 1
16	GET/SET	ACTION ON LOSS OF ETHERNET/IP	US INT	0 = FAULT 1 = IGNORE COMM FAULT 2 = AC TECH SPECIFIC
17	GET/SET	FORCE TRIP	BOOL	0 to 1
The drive shows the "nF" fault on the LED display.				

If Attribute #5 NET CONTROL is set to 1, the RUN and STOP events are triggered according to the following event table:

ATTRIBUTE RUN FWD	ATTRIBUTE RUN REV	TRIGGER EVENT	RUN TYPE
0	0	STOP	N/A
0 -> 1	0	RUN	RUN FORWARD
0	0 -> 1	RUN	RUN REVERSE
0 -> 1	0 -> 1	NO ACTION	N/A
1	1	NO ACTION	N/A
1 -> 0	1	RUN	RUN REVERSE
1	1 -> 0	RUN	RUN FORWARD

9.2.9 AC/DC Drive Object - Class 0x2A (42 dec)

AC/DC DRIVE CLASS ATTRIBUTES				
Attribute ID	**Access Rule**	**Name**	**Data Type**	**Value**
INSTANCE 0				
1	GET	REVISION	UINT	1
2	GET	NUMBER OF INSTANCES	UINT	1
INSTANCE 1				
1	GET	NO. OF SUPPORTED ATTRIBUTES	USINT	12
2	GET	ATTRIBUTE LIST	ARRAY	
3	GET	AT REFERENCE	BOOL	Speed AtRef
4	GET/SET	NET REFERENCE	BOOL	0 = Local SpdRef 1 = Net SpdRef
6	GET	DRIVE MODE	USINT	1 = Open Loop Spd Control 2 = Vector Mode 3 = Torque Mode 4 = PID Mode
7	GET	ACTUAL SPEED	INT	Actual Speed (RPM)
8	GET/SET	SPEED REFERENCE	INT	Speed Reference (RPM)
9	GET	MOTOR PHASE CURRENT	INT	Actual Current (0.1A)
15	GET	MOTOR PHASE CURRENT	INT	Actual Power (W)
16	GET	INPUT VOLTAGE	INT	(V)
17	GET	OUTPUT VOLTAGE	IN	(V)
29	GET	STATUS OF SPEED REFERENCE	INT	0 = Local Spd Ref 1 = Net Spd Ref

AC DRIVE CLASS SERVICES			
Service Code	Implemented For		Service Name
	Class	Instance	
0x0E	YES	YES	Get_Attribute_Single
0x10	NO	YES	Set_Attribute_Single

9.2.10 TCP/IP Interface Object - Class 0xF5 (245 dec)

TCP/IP INSTANCE ATTRIBUTES				
Attribute ID	**Access Rule**	**Name**	**Data Type**	**Value**
INSTANCE 1				
1	GET	STATUS	DWORD	
2	GET	CONFIGURATION CAPABILITY	DWORD	
3	SET	CONFIGURATION CONTROL	DWORD	
4	GET	PHYSICAL LINK OBJECT	STRUCT of:	
		PATH SIZE	UINT	# 16-bit words in path
		PATH	Padded EPATH	12 Bytes maximum
5	GET / SET	INTERFACE CONFIGURATION	STRUCT of:	
		IP ADDRESS	UDINT	0 = No IP address configured
		NETWORK MASK	UDINT	0 = No network mask configured
		GATEWAY ADDRESS	UDINT	0 = No IP address configured
		NAME SERVER	UDINT	0 = No name server address configured
		NAME SERVER 2	UDINT	0 = No 2nd name server address configured
		DOMAIN NAME	STRING	48 ASCII characters maximum 0 = No domain name configured
6	GET / SET	HOST NAME	STRING	64 ASCII characters maximum 0 = No host name configured
8	GET	TTL VALUE	USINT	1 - 255
9	GET	MCAST CONFIG	STRUCT of:	
		ALLOC CONTROL	USINT	
		RESERVED	USINT	0
		NUM MCAST	UINT	# of allocated IP addresses
		MCAST START ADDR	UDINT	

TCP/IP INTERFACE CLASS SERVICES			
SERVICE CODE	IMPLEMENTED FOR		SERVICE NAME
	CLASS	INSTANCE	
0x0E	YES	YES	Get_Attribute_Single
0x10	NO	YES	Set_Attribute_Single

9.2.11 Ethernet Link Object - Class 0xF6 (246 dec)

ETHERNET LINK CLASS ATTRIBUTES				
Attribute ID	**Access Rule**	**Name**	**Data Type**	**Value**
INSTANCE 0				
1	GET	REVISION	UINT	2

ETHERNET LINK INSTANCE ATTRIBUTES				
Attribute ID	**Access Rule**	**Name**	**Data Type**	**Value**
INSTANCE 1				
1	GET	INTERFACE SPEED	UDINT	speed in Mbps
2	GET	INTERFACE FLAGS	DWORD	
3	GET	PHYSICAL ADDRESS	ARRAY of 6 USINT	MAC layer address
6	SET	INTERFACE CONTROL	STRUCT of:	
		CONTROL BITS	WORD	
		FORCED INTERFACE SPEED	UINT	speed in Mbps

ETHERNET LINK CLASS SERVICES			
SERVICE CODE	IMPLEMENTED FOR		SERVICE NAME
	CLASS	INSTANCE	
0x0E	YES	YES	Get_Attribute_Single
0x10	NO	YES	Set_Attribute_Single

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